THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. VII. No. 149—10th YEAR.] LONDON, JULY 6, 1858. [Subscription per Ann. { 15s. in Advance / 18s Credit } DOUBLE No. Price 1s.

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The Advertiser has brought his Fire-Clay Retorts to great perfection, both as to quality and finish. Many have stood three and four years.

Every description of Fire Goods in any quantity always on hand. The Fire Clay is the very best in the North of England. Stock never less than 10,000 tons weathering.

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Apply, G. H. RAMSAY, of Derwenthaugh Fire-Brick Works, near NEWCASTLE-ON-TYNE.
Aug. 22, 1856.

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TENDERS wanted for the erection of a GASHOLDER, 30 feet diameter by 14 feet deep, with six columns and framework; &c.

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MANUFACTURERS OF EVERY DESCRIPTION OF
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&c. &c.
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A large stock of Fire-Clay Goods always on hand in London, at the lowest wharf prices, at Messrs. CHRISTIE & Co.'s Wharf, 64, Bankside, SOUTHWARK.

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TO be sold, a Cast-Iron Tank and Gas-HOLDER. The former is 25 feet in diameter, 12½ feet high, with Inlet and Outlet, outer Connexions, and Stand-pipe complete; the latter is 24 feet in diameter, in good condition, with Suspension Oak Frame, Chains, Wheels, and Counterpoise. Price £200, as they stand at Lewes, Sussex, where they may be inspected on application.

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Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS RETORTS and OTHER OBJECTS in FIRE CLAY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire Clay Retorts in the United Kingdom; and orders for Fire Clay Retorts of all shapes and dimensions, Fire Bricks, and every other article in Fire Clay, are promptly executed at their works as above.

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Original Manufacturers of Wrought-Iron Gas Tubes, and Holders of the present Patents; Inventors and First Makers of LAP-WELDED FLUES for Steam Boilers.

J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water, and the largest Orders may be executed in a few days.

The eminent Engineer, Mr. Perkins, confines himself altogether to the use of John Russell and Co.'s Tubes in his High-Pressure Steam Patents.

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N.B. All Goods thoroughly Tested before sent out, and Warranted.

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begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the Manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other Articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.

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supplied with all the WORKING GAS BOOKS, GAS FORMS, &c., on the shortest notice. Also, SHARE CERTIFICATES and COMMON SEALS prepared in the best manner for all New Companies by

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N.B.—List of Books, &c., sent post free on application.

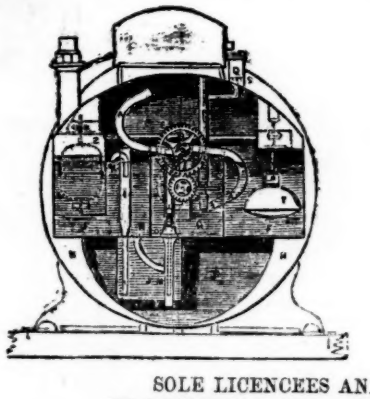
WANTED, by the advertiser, a SITUATION as Meter or Fitting Inspector, or In-door or Out-door Foreman in a large Gas-Work. Thoroughly understands Manufacturing Gas, Main and Service Laying, and Fitting in all its branches. Good Accountant, &c. Would prefer being somewhere near or in London. Good testimonials can be given.

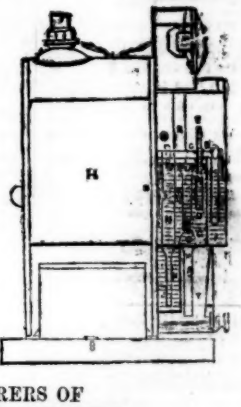
Address, M. G., 51, High Street, Marylebone, LONDON.

ON Sale, at the Wolverhampton Gas-WORKS, FOUR CAST-IRON GUIDE-COLUMNS, each 20 feet long, 11 inches diameter at bottom, and 9 inches diameter at top, with T Guide-Bars and Distance-Brackets. Also, TWENTY CAST-IRON COLUMNS, each 11 feet long, 6 inches diameter at bottom, and 4 inches diameter at top—all with square base Flanges and neatly-moulded Caps.

Apply to THOMAS PROUD, Engineer.

CROSLEY & CO.,
GAS-METER MANUFACTURERS,
103, SOUTHWARK BRIDGE ROAD, LONDON.





SOLE LICENCEES AND MANUFACTURERS OF
W. CROSLEY'S AND CROSLEY AND GOLDSMITH'S
PATENT STANDARD SELF-ADJUSTING AND COMPENSATING GAS-METERS,

By which the True Water-Line is constantly maintained, and accuracy of measurement at all times secured. SEVERAL THOUSANDS OF THEM HAVE BEEN FIXED, AND ARE NOW AT WORK, and numerous Testimonials from eminent Gas Engineers, expressive of their approbation of them, may be seen at the Manufacturers'.

Manufacturers of LOWE'S PATENT MOTIVE-POWER METER, for situations where there is an inadequacy of pressure to supply the special requirements of certain consumers in low grounds during the day or night.

Also, Manufacturers of EXPERIMENTAL METERS, GASHOLDERS, GOVERNORS, MINUTE-CLOCKS, PHOTOMETERS, &c. &c., similar to those used by Mr. King, of Liverpool.

C. and Co. continue to manufacture ordinary WET METERS of the very best description, Mr. W. Crosley having been for many years the principal and confidential assistant of his relative, the late Mr. Samuel Crosley, of Cottage Lane, City Road, up to the time of his decease, in which capacity he communicated to W. C. the secret of the mixture of the metals which has rendered the Crosley Meter so durable and superior to all others, as is evidenced by a large number of them being still at work after having stood the test of nearly a quarter of a century's use.

JOURNAL OF GAS LIGHTING NEWSPAPER PENNY

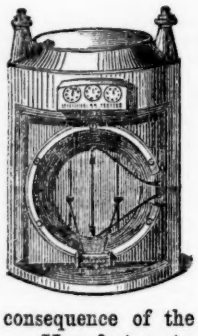
By Her Majesty's Royal Letters Patent.

JAMES MEACOCK,

PATENT DRY and IMPROVED WET GAS-METER WORKS,

7, SNOW HILL, AND 16, WEST STREET, LONDON.

ESTABLISHED 1836.



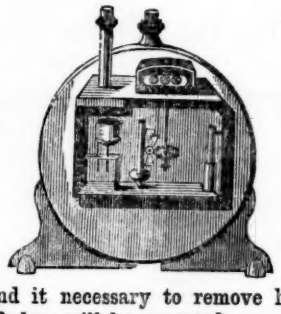
J. MEACOCK begs to call attention to his patent method of securing the Leather diaphragm of his Dry Meter. Instead of using the soldering iron for this purpose, it is held between two flat Metal Rings, and screwed up sound to a metal frame, as shown in the drawing.

By this improvement the perishing effect of hot tools to leather being avoided, its durability must be longer; also, its repair when needful is most simple, as a new leather diaphragm can be applied by merely unscrewing the old one from the rim or frame to which it had been screwed up.

Meters of Gas Companies being subject to so much wear and tear, J. M. begs leave to assure those who may honour him with their commands, that nothing but the stoutest materials for cases, the hardest gas-resisting metals, and best foreign leather for the interiors, will be used, and none but first-class workmen employed in their construction.

Wet Gas-Meters Repaired and Reconstructed with J. Meacock's Modern Improvements.

METERS SENT ON APPROVAL.



In consequence of the great demand for the above Meters, J. Meacock has found it necessary to remove his Manufactory to more extensive Premises, 16, West Street, Smithfield, where Orders will be executed on the shortest notice.

"ALL DOUBTS REMOVED."

DEFRIES' celebrated Dry Gas-METERS, of which there are 80,000 in use in Palaces, Churches, Chapels, Royal Dock-yards, Club Houses, Public Offices, and other buildings throughout the Empire, the Continent, and Colonies.

His meter for 1500 lights, in use upwards of ten years at the Royal Italian Opera, until that building was destroyed by fire, was long afterwards dug out of the burnt ruins, then tested by the Chartered Gas Company and found inflexibly correct.

On the 9th of June, 1858, at the Western Gas Company, his meter for 150 lights, after considerable use, was doubted, and subjected to the most variable tests, from the full lighting down to a single jet, and in each case, as in numerous other instances, accuracy was finely indicated.

His two large meters at the Thames Tunnel have been in constant use day and night for upwards of twelve years (one continuation of dark hours), subjected to the wear and tear of 75 years, as compared with the ordinary hours of using gaslight above ground.

Gas Companies honouring Mr. Defries with their commands for his PATENT DRY METER, which has done so much service in simplifying the fitting up of gas, as well as checking surreptitious burning, will be guaranteed perfection for five years free of charge.

Defries' Prize-Medal Gas Baths, Gas-Cooking and Heating Stoves. The Polytechnic Gas Fire, with indestructible fuel, in daily operation (Saturday excepted) at the Office, 145, REGENT STREET, and the Manufactory, Euston Road, Fitzroy Square, LONDON.

EDWIN DIXON,

WOLVERHAMPTON PATENT WROUGHT-IRON TUBE WORKS,

Originally established in 1833,

Manufacturer of Gas and other Tubes, Fittings, and articles of every description belonging to Gas, Water, or Steam.

E. D. had the honour of receiving the

PRIZE MEDAL

warded to this Manufacture by the COUNCIL of the GREAT ENGLISH EXHIBITION of 1851; and from the latter date has supplied many towns exclusively with GALVANIZED and other Tubes for Gas and Water, under GOVERNMENT ENGINEERS.

A City, containing 150,000 inhabitants,

has recently been entirely supplied with Tubes made at the above-named Works, and several others with populations nearly as great; in fact, the reputation now acquired induces this notice to the public.

Large Stocks generally on hand, averaging from one to three hundred thousand feet.

HYDRAULIC PRESS TUBES,

o resist 6000 lbs. and upwards to the square inch, extensively manufactured.

STOCK DIES and SCREWING TACKLE,

of the best possible description.

Every Tube carefully tested with Hydraulic Pressure before leaving the Works.

THE PURIFYING-HOUSE SUPERSEDED.

MR. LAMING (Inventor of the Revivified Oxide of Iron Purification) has the satisfaction to announce that Gas may now be purified in a manner that combines unusual commercial advantages with all the possible requirements of the sanitary officer and the public. All that need be said to call attention to the new process is, that instead of the purifying-house, two vessels of small area, placed after the condenser, suffice; that these vessels never have the least communication with the atmosphere; and that neither lime, oxide, nor any other substance foreign to the gas itself is brought into contact with it. Gas engineers will perceive among the advantages thus offered, economy in room, labour, and materials; impossibility of nuisance; and total absence of injury to the illuminating power.

Particulars by addressing RICHARD LAMING, 118, FENCHURCH STREET.

CRYSTAL PALACE DISTRICT GAS COMPANY.—A GASHOLDER, 40 feet by 12 feet deep, to hold 15,000 cubic feet, TO BE SOLD CHEAP, if removed immediately, the space being required for alterations.

Apply to Mr. MAGNUS OHREN, Secretary and Manager to the Company, Offices, Bell Green, Sydenham, KENT (S.E.).

TO GAS COMPANIES, ENGINEERS, AND OTHERS.

WANTED to purchase a good second-HAND GASHOLDER, with or without Cast-Iron Tank.

Full particulars as to size, price, &c., to be sent to J. H. HETHERINGTON, Slough, BUCKS.

TO Let, from the 1st day of August next, for One Year, all the TAR produced at the Portsea Island Gas-Works, HANTS.

Tenders to J. A. METHVEN, Lessee of the above Works.

TO NAPHTHA, CREOSOTE, AND GAS TAR DISTILLERS.

THE Nottingham Gaslight and Coke COMPANY are desirous to dispose for a term of years of the TAR manufactured at their Stations at Nottingham, Radford, and Basford, now amounting to about 1500 tons per annum. The whole of the Works of the Company are eligibly situated for Railway transit, and the principal Station (in the Town of Nottingham) is located on the margin of the Nottingham Canal, within one mile of the navigable river Trent.

The Tar must be removed by the Contractor from the Works of the Company, so as that not more than fifty tons shall accumulate at any Station.

Tenders, specifying the price per ton, and the term of years to which the contract is proposed to extend, will be received at the Office of the Company, Week-day Cross, Nottingham, on or before Wednesday, the 14th day of July next.

By order of the Committee,
JOSEPH B. LOMAS,
Accountant to the Company.

Nottingham Gas Office, June 22, 1858.

TO THE GAS COMPANIES OF GREAT BRITAIN AND THE CONTINENT.

CANNEL AND COAL FOR GAS PURPOSES.—Fifteen years' connexion with one of the largest Gas Concerns in England, enables us from practical experience to certify that the CANNEL and COAL we offer are those best suited for Gas purposes.

On application, we shall have much pleasure in forwarding our Tabulated Statements of Analyses, with Prices and Terms; also References as to respectability.

All Contract Orders have our careful and best attention.

EMANUEL TURNER and Co., Exporters of Cannel and Coal, 34, Castle Street, LIVERPOOL.

ADDISON POTTER.

WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,

Manufacturer of Clay Retorts, Fire Bricks, and every description of Fire Clay Goods.

GAS-WORKS ERECTED, ALTERED, VALUED, OR LEASED, BY

GEORGE WALCOTT,

GAS AND CONSULTING ENGINEER,

BEAUMARIS GAS-WORKS, ANGLESEA,

who has erected twenty Gas-Works during the last four years, all of which are giving satisfaction.

London Office, 24, Abchurch Lane, CITY.

WILLIAM RYDER,

GENERAL MINERAL AND METAL AGENT AND MERCHANT,

4, DEAN STREET,
NEWCASTLE-ON-TYNE,

is prepared to supply Gas and Water Companies with Apparatus and Appliances of every description, including Cast and Wrought Iron Goods, Coals, Fire-Bricks, Retorts, &c. &c.

Any communications addressed to him as above shall have prompt attention.

JAMES FEATHERSTONE,

ENGINEER,

Manufacturer of GASHOLDERS, IRON ROOFS, and every description of Gas Apparatus.

ALLIANCE IRON WORKS,
CLAYTON, near MANCHESTER.

JOHN ROGERSON and CO.,

NEWCASTLE-ON-TYNE AND MIDDLESBRO'-ON-TEES.

Wrought and Cast Iron Pipes, Cast-Iron Retorts, and all kinds of Foundry Work necessary for Gas-Works. Fire-Bricks and Clay Retorts. Gas Coals of every description. Pig, Bar, and Plate Iron.

CHARLES BOTTEN and SON,

ENGINEERS AND METER-MAKERS,

CRAWFORD PASSAGE, RAY STREET,
CLERKENWELL, LONDON (E. C.).

Manufacturers of Station and Patent Protector Consumers' Meters, Patent Slide-Valves, Gas-Fittings, Pipes, &c.

Also, High-pressure Cocks, Hydrants, Closets, and all Water-Fittings.

EIGHTON MOOR GAS COALS.—Parties wishing to be supplied with these first-class Gas Coals will please to apply to Mr. MATTHEW NESBIT, EIGHTON MOOR OFFICE, NEWCASTLE-UPON-TYNE. These coals are well known as among the richest in gas, and working the roundest on the River Tyne. They are extensively used by metropolitan gas works.

CYRUS HANSON,

HENLLIS WORKS,
NEWPORT, MONMOUTHSHIRE,

Manufacturer of Clay Retorts, Fire-Bricks, &c.

ROBERT MACLAREN & CO.,

EGLINTON FOUNDRY, GLASGOW,

Manufacturers of all sizes of Cast-Iron Main Pipes, by an improved Patent. General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

M. SHEEN, Gas and Railway Lantern Maker, 90½, Holborn Hill, begs to inform Managers of Gas-Works, &c., that she continues to contract and supply Lanterns on reasonable terms, and keep them in repair by the year.

PATENT FLEXIBLE GAS TUBING, VULCANIZED INDIARUBBER HOSE-PIPES, WASHERS, PACKING, &c.

JAMES LYNE HANCOCK begs to announce a considerable REDUCTION in PRICE of his PATENT VULCANIZED INDIARUBBER TUBING.

VULCANIZED INDIARUBBER AIR-TIGHT BAGS, any size, for Gas Mains, with flexible tubes attached, and fitted with stop-cocks complete.

Manufactory and Warehouse, No. 6, Goswell Road, LONDON (E.C.).

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ERRATUM.

At page 385, first column, under the head of "Court of Common Pleas," *for* "Friend *v.* Bennett," *read* "Frend *v.* Dennett."

NOTICES.

The subscription is 15*s.* per annum, if paid in advance during the month of January, or 18*s.* credit, in two sums of 9*s.* each, in July and January of each year. Post-Office orders must be made payable at the Charing-Cross Money-Order Office, to William H. Bennett, No. 42, Parliament Street, Westminster.

The next number will be published on Tuesday, July 20, and the subsequent numbers on each successive alternate Tuesday.

Stamped copies, when forwarded by post, must be folded so as to expose the stamp; they are otherwise liable to the full postage charge for letters.

This JOURNAL has been duly registered at the General Post Office for transmission abroad.

All Communications to be addressed to the Editor, No. 42, Parliament Street, Westminster; and orders for Advertisements to the Publisher, Mr. W. B. King, No. 11, Bolt Court, Fleet Street.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JULY 6, 1858.

NOTES UPON PASSING EVENTS.

WHEN a salaried servant of the Government goes out of his way unnecessarily, but systematically, to attack a great branch of private industry, it becomes the duty of those who undertake, as far as they can, to represent the maligned interests in question, to challenge his assertions as often as they are made. It is upon this principle, therefore, that we feel again compelled to protest against the shameful abuse of his official position of which the Registrar-General, or his representative, has been guilty in the last "Weekly Return of Births and Deaths in London," published June 28. In this document, after coolly stating that "the mean death-rate of the *least* unhealthy districts of England would be 20 in 1000, were it not that the increasing population gives them an undue proportion of young and middle-aged people, by which the proportional number of deaths is reduced to 17 in 1000,"—the Registrar-General goes on to say that "by applying the ascertained rates of mortality in the comparatively Healthy Districts, it is found that the annual deaths in London would be at the rate of 15·32 in 1000." This is very strange logic, we think. Population in most countries of Western Europe has a tendency to increase, and therefore there can be no reason for considering the effect of such increase as a ground for rejecting its influence upon what it has lately been the fashion to call the death-rate. The asserted normal rate of mortality so often repeated by the Registrar—viz., 17 in 1000—is thus shown, by his own words, to be an abnormal one; and, even according to his own returns, the least unhealthy districts of England really exhibit a death-rate of 20 in 1000. The mortality of London has not of late years attained 23 in 1000; and surely, when the mode of living of its population is taken into account, such a rate of mortality must be considered to be satisfactory.

But we do not desire so much to challenge the alarmist tendency of the Registrar-General's Reports as we desire to protest against his open attacks on, or his covert accusations against, the London Water Companies. He cannot even allow that those "companies have of late years supplied water infinitely superior in quality to the water which they drew from some parts of the Thames," without adding that the water so obtained is "now admitted by everybody, *even their retained chemists*, to be offensive." Why this gratuitous insult to such men as Brande, Taylor, Ure, Spencer, Cooper, &c.? Are they more likely to have told deliberate untruths because they were retained to defend the Water Companies than the Registrar-General and his friends, who were retained to attack them, were? But the disingenuousness of this accusation must be more apparent if we bear in mind that the pollution of the Thames has gone on increasing in a very rapid ratio within the last three years, and that it is precisely three years since the London Water Companies have obtained their supply from the new sources they resorted to in consequence of the enactments of the year 1852. In 1852 the river was not so decidedly a common sewer as it is now; but even then the best of the Metropolitan Companies were engaged in the discussion of the propriety of removing their sources of supply to those parts of the river which were above the reach of the tides, and the Lambeth Company had actually commenced its works for that purpose. Until London Bridge was demolished, and until the water-closet system was so indiscriminately applied in the Metropolis, there was, indeed, very little fault to be found with the waters of the Thames even in the heart of London; so that a chemist, retained or unretained, might fairly have defended their distribution. It is, however, manifestly unfair to insinuate that Chemists could have been found in 1852 to defend that which would unquestionably have been unjustifiable in 1858; and therefore it is that we consider the passage of the last Report to which we allude as an unwarranted attack upon the whole profession of Chemists and upon the Water Companies. No doubt the Registrar-General has difficulty in filling his weekly sheet of grievances; but the necessity for writing epigrammatic sentences for the especial benefit of the old ladies of London, who like "to sup their full of horrors," can hardly be admitted as a justification for an ungenerous abuse of an official position, or an indiscriminate attack on a learned profession.

All ordinary discussions upon Sanitary matters are, however, now suspended on account of the fearful state of the Thames; and legislators of all denominations are busying themselves with the question. It is odd that, whilst this movement is taking place at home, the same evil should begin to force itself upon the attention of some of our foreign neighbours in nearly as cogent a manner. We know that at Ghent, Liége, Antwerp, Brussels, Rotterdam, the Hague, Amsterdam, Copenhagen, Hamburg, &c.—in all cases, in fact, where the rivers are converted into the recipients of the foul refuse of large agglomerations of people, those rivers are becoming day by day more repulsive. Following blindly in our track, foreigners have begun, indeed, to adopt on a large scale the water-closet system we have so injudiciously applied without adopting any precautions against its possible abuse; and, like ourselves, they are beginning to discover that self-taught Sanitary Reformers are not such good guides as Eminent Engineers would have been. It would be idle now to revert to the history of past blunders, were it not that, perhaps, the lessons to be derived from them would prevent the rulers of the world from a repetition of their mistakes, and that so the sad story of the last Manchester Corporation Water Bill would not be renewed. We say "perhaps," because, alas! there seems to be a strange incapacity on the part of our own rulers to benefit by the lessons of the past or to turn aside from the promptings of those who have so long misled them. There does not exist, however, abroad the same ridiculous dread of properly qualified Engineers which characterized the late administration of the Board of Health; and, more fortunate in that respect than we, the foreign nations to which reference is thus made may think it advisable to examine this great question of the discharge of sewerage before it is too late; and they may be sure of this, that precisely in proportion to the improvements which take place in their water supplies will the

necessity for the improvement of their sewers make itself felt; for the simple reason that, whenever a copious supply of water is to be obtained, the old cesspool system must, sooner or later, be abolished.

We dwell somewhat on the circumstances connected with the sewerage and water supply of other countries which have lately come under our notice, because they afford curious and impartial illustrations of many opinions expressed in our own columns. Thus, in another matter, we find that in Brussels, where the municipality has lately completed a very excellent water supply, on the constant delivery system, the waste of water is already so great as to require the adoption of rigorous measures of repression. This must always, we contend, happen when municipalities undertake the discharge of a duty which would be much better discharged by a commercial company; for it is absurd to expect that the servants of a municipal body should be exempt from the influence of those who are their masters. Whatever may be the explanation of the fact, it is certain that in America, in England, and in Belgium, the constant supply system, without the compulsory use of meters, has led to such a lavish waste of water as to menace serious consequences to the whole community.

At the same time that it becomes important to notice an evil attending the abuse of a copious water supply, we may be allowed also to call attention to the fearful mischief which may arise from the total absence of that blessing. At Paris, the boasted centre of civilization, on the occasion of the late fire in the magazine called the *Grand Condé*, water was only obtained by the barbarous mode of passing buckets, or, as the French say, "*en faisant la chaine.*" What would have happened at the London Docks the other day had we been reduced to such an old-fashioned system? And how important must it be for all great commercial cities to place themselves beyond any such risk. Even small country towns might derive a lesson from this occurrence at Paris, for even they are too often exposed to danger from fire; and we fear, also, that many of them have lately been in a state somewhat like that which is said to have prevailed at Frankfort, where, during the late droughts, water has been selling at 1d. or 1½d. per pail.

In the French journals the Minister of Agriculture of that country has lately thought it consistent with his duty to go out of his way to sneer at our country because it refuses to publish its agricultural statistics. Now we ourselves have always in this JOURNAL expressed our own dislike to all such official attempts to guide the operations of trade; and therefore we feel bound to reply, as far as we can, to the taunts of our contemporary. In the first place, we would observe that all such publications must be useless, because they cannot be prepared with sufficient rapidity to enable any really valuable calculations to be made upon them; and the Report of the Minister of Finance above-mentioned may itself be appealed to in confirmation of this opinion. He therein states that no fewer than 80,000 persons were employed to collect the elements of the agricultural statistics of France; and sure we are that by the time the returns so obtained were classified, abstracted, and published, the public already knew, far better than it could do by any such mere hearsay evidence, the real state of the markets. But then, in the second place, rises the question of what must be the cost of an inquiry of such a colossal magnitude? 80,000 people cannot be employed without being paid, "either in meal or in malt;" and we are certain that in estimating the collection of these statistics to have cost at least £50,000 we are not beyond the truth. Is it worth while to spend thus £50,000 a-year for the gratification of a few lovers of statistics? for we contend that no merchant ever based his operations upon the official tables; and that, for all practical purposes, the agricultural returns of the French Minister are as valueless as those of our own Registrar-General in sanitary matters. Most distinctly do we assert that these arrays of figures are but learned toys, and that all the nations of Europe would gain by their being at once put a stop to. Official statistics have been defined to be the art of grouping figures for the purpose of disguising truth; and, without entirely adopting this opinion, we confess that we suspect it to be nearly the real expression of the case. Certainly, the statistics published by our own Government, to which such men as Sauvestre, Rendu, Léon Faucher, and Ledru Rollin so frequently refer as confirmations of their views with respect to the social misery and the probable immediate ruin of England, are exposed to this accusation, and their authors must be held responsible for the diffusion of much error.

In one of the local journals of Devonshire we met, a few days since, with a paragraph which convinces us that the General Board of Health only requires a fresh lease of power to resume the systematic jobbery of former years, against which Sir B. Hall protested so violently before he took office. The paragraph to which we allude is, in fact, an extract from a report by Mr. Lindsey Blyth to the Local Board of Health of Barnstaple, as to the chemical analysis of the waters proposed to be supplied to that town; from which it would appear that the Board have their own laboratory, and that it allows its Chemist to interfere with the operations of the local authorities the Board is supposed to guide and to control. How long this laboratory has existed we know not, but we commend it to the notice of administrative reformers; for we do not believe that it can be the intention of the Legislature to support out of the national funds a laboratory from which the clients of the Central Board of Health can obtain chemical advice at a cheaper rate than they could do by employing unofficial chemists. If it be unfair, as unquestionably it was, for the Superintending Inspectors of the Central Board to exercise their official influence for the purpose of securing to themselves private practice as engineers, it must be equally unfair for the Chemist of the Board to adopt an analagous course. Mr. Blyth's interference with the ordinary exercise of the profession of chemistry seems, therefore, to us very objectionable; but it is manifestly an injustice to his professional brethren that he should be allowed to use the Government establishment and the implements it may contain to enable him to compete with those who have, against him, the additional disadvantage of not being connected with the Board which is supposed to be competent to advise in matters wherein possibly there may be a discussion as to the quality of waters. Certainly, if Mr. Lindsey Blyth be entitled thus to assume a position which enables him to act both as counsel and judge, that position should be clearly defined and legally recognized, and his qualifications for the place should be indisputably proved. At present we are not aware that he, or, indeed, that any of the superior officers of the General Board of Health, have gone through a competitive examination; although it must be confessed that such examinations, as now conducted, are but unsatisfactory certificates of anybody's merits. The very report in the Devonshire paper to which we have alluded induces us, moreover, to entertain serious doubts upon the propriety of the anomalous position so assumed; for a water containing 11·80 grains per gallon of inorganic matters in solution, of which 5·80 grains consisted of the sulphate of lime and 3·40 of the chloride of sodium, was therein pronounced to be a suitable water for a town supply.

The inhabitants of some of our inland towns, such as Bury St. Edmund's, where no water supply exists, appear to be suffering nearly as much from the foul smells of the outfalls of their sewers as even the Metropolis itself. Evidently, in the case thus specially referred to, the water-closet system cannot be held responsible for the evil; because, of course, it cannot be carried out unless a copious supply of water exists. But these results, obtained by the mere surface drainage of this town of Bury, show that, even in such places, it is necessary to disinfect the sewerage before pouring it into the natural watercourses. The waste waters from private houses there cast into the kennels, the drainage waters which filter into the sewers from streets and yards, contain gaseous or other elements susceptible of a very offensive decomposition; and the investigations of both English and French chemists go to prove that the emanations from ordinary town sewerage are nearly as dangerous as those to be observed in our London sewers. We ourselves hold that all municipalities ought to be compelled to abate or to prevent any nuisance of this description; and we are convinced that there are in existence legal modes of so doing. But if the Government of the day really were anxious to improve the Public Health, it ought rather to pass a short declaratory measure to simplify, and if needs be to extend, the power of the constituted tribunals to enforce the necessary measures, than to seek, as they now do, merely to absorb the powers of local authorities in the hands of the State.

In writing this, we are reminded that at last something like a serious opposition to both the Local Government Bill and the Public Health Bill is about to be undertaken. Better late than never! but it is to be feared that in the present temper of the Legislature no real examination of these important measures will be undertaken. The state of the Thames is frightening the most determined opponents of governmental centralization out of their former opinions. In the meantime Mr. Ayrton

and Sir J. Duke have introduced a measure for the amendment of the so-called Smoke Nuisance Abatement Act, which is too reasonable to allow us to hope that it would be acceptable to the mischievous empirics who have hitherto pretended to regulate such matters. The new Bill contains some severe clauses for the purpose of ensuring the effectual prevention of a smoke nuisance; but it also provides for a fair trial and for a proper mode of instituting proceedings.

Some interesting boring operations have lately been carried on at Naples, of which we propose shortly to give a detailed description; and the Town Council of Ostend are busily engaged in sinking an artesian well for their municipal supply. The result of the Harwich boring was so peculiar, and we think that it will be found to be so analogous to the results likely to be obtained at Ostend, that we shall watch the latter operations with considerable interest. At any rate, these borings serve to throw great light on the internal structure of the globe, even when, as at Highgate, Southampton, and Harwich, they are unsuccessful in securing a supply of water. We may add that we hear that the well at Rugby has been already carried to a depth of more than 700 feet without success.

THE STATE OF THE THAMES.

Bucolic poets used formerly to dilate upon the beauties of the "silent highway" which traversed the Metropolis of England; and they were wont to praise the Thames for qualities which we livers in the days of Boards of Health and of Sanitary Reformers must consider to have been myths. We are told that the stream formerly held to be worthy of being a "bright example," was not only "deep, but clear;" now, alas! it is at times deeper than it was of yore, but so opaque, and so foul, that even the eels are said to have abandoned its shores, whilst at certain times of the tides it is impossible to breathe the mephitic vapours which arise from this foul Malabolgie. This change has not come upon us suddenly; we have received due warning of the fate we ought to have expected from the hasty legislation and the mischievous empiricism prevailing in high quarters; but there seems to be as little disposition on the part of far too many of our rulers even now to profit by the lessons of experience as ever, and loquacious quackery is as rampant on this all-important subject as it has been for the last ten or twelve years. The very extent of the evil under which London is suffering may perhaps work its cure; and one of the most hopeful signs of the times is to be found in the fact that some of the really earnest Sanitarian Reformers begin to suspect that the system they themselves have endeavoured to enforce may be the very cause of the present sad condition of the Thames.

For indeed Lord Ebury told the truth when he stated that the continually deteriorating state of the Thames was to be attributed to the indiscreet haste with which the water-closet system has been forced upon the Metropolis, before efficient measures had been adopted to prevent the matters thus cast into the sewers from becoming a greater nuisance than they were under the former cesspool system. The fact is, that in this matter the Legislature, under the mischievous guidance of Mr. Chadwick and his satellites, has begun at the wrong end, and is mainly responsible for the dreadful evils with which we are menaced. Nor is this the only error committed by our law-makers; for even when they pretended to amend the Local Government of the Metropolis, they were perversely ingenious enough to introduce such clauses into the Act of 1855 as rendered it morally impossible for the authorities then called into existence to do any real service. It is very fine, no doubt, for Mr. Delane and Mr. Robert Lowe to abuse, in the columns of their organ, the *Times*, "Fabius Thwaites, the chattering board, and noisy engineers;" and no doubt they are anxious to divert public attention from the consequences of the impertinent interference of their colleague, Sir B. Hall, with the chosen representatives of the ratepayers. But the fact is, as Lord J. Manners very properly said, that the power of exercising a veto on the proceedings of the Metropolitan Board, so abundantly used by the *liberal* member for Marylebone, must, sooner or later, have brought the proceedings of that body to a dead lock. Again do we repeat that if any two men be more to blame than others for the present awful state of the Thames, those men are Mr. Chadwick and Sir B. Hall—the former for creating that state, the latter for having prevented any attempt to remedy it during the last years of his tenure of office; but the question is not now whom we are to blame, but how we are to remedy or to palliate the present evil, which is indeed becoming colossal in its proportions. It is usually about the end of the summer that the public health of our southern districts is the most unsatisfactory; it behoves us, therefore, to use the intermediate period in such wise as to guard, as far as it is humanly possible, against the occurrence of any pestilence from the state of the river or of its banks.

It is important to observe that public opinion is again passing from the consideration of some of the real facts of this case to dwell almost exclusively upon others, which, although no doubt of importance, only exercise a partial influence on the general result. We mean that there appears to be a tendency to attribute all the evil to the fermentation or decomposition of the mud, whereas the chemical changes effected in the waters themselves are at least as potent as those effected in the solid deposit from the Thames. It is, indeed, worthy of remark that the sickening stink (there would be affectation in using any other word) is most observable whilst the flood-tide is making, and whilst the mud banks are covered; and therefore it is that we are anxious to keep the attention of the authorities entrusted with the discharge of this branch of our ædility from being concentrated on the embankment scheme alone, or from their neglecting to consider the important question of deodorizing the sewerage. The only objection which we believe can be raised against the report of Messrs. Bidder, Hawksley, and Bazalgette, is precisely because they do not seem to us to dwell with sufficient force upon the necessity for deodorization at all seasons of the year. Any partial measure of this description will, we firmly believe, prove unsatisfactory, because the solid deposit from the undeodorized sewerage of the winter months will accumulate on the banks of the river, and decompose, as it now does, in the summer. But, however this may be, the public may be sure that the greatest part of the present evil is occasioned by the decompositions of both the sewerage and the tidal waters, under the influence of the extraordinary heats of the last month; and that the small quantity of fresh water coming down from the upper part of the valley of the Thames has exercised, also, a great influence on the noxious properties of the stream. Partially or entirely, therefore, the sewerage of London must be purified before it is cast into the stream; and this operation we regard as being even more important than the execution of any embankment scheme or any covering of the mud.

Of late it is said, but we can hardly believe it to be true, that Mr. Gurney has been amusing himself by casting lime from barges, in the state of a paste, into the Thames opposite to the Houses of Parliament; and we know that the Board of Woods and Works has attempted to purify the Serpentine by a similar waste of money. When will our Government blunder into the selection of a competent adviser? Surely the use of lime as a disinfectant ought to be sufficiently understood at the present day to have prevented its being applied for such a purpose in this form. Why has not the milk (the fluid hydrate) of lime been applied instead of the paste? especially as Messrs. Hawksley and Bidder have long since recommended the use of the former. Judiciously employed, this milk of lime will, no doubt, tend greatly to abate the nuisance of the London sewerage; but we are thus thrown back again, practically, to Mr. Wicksteed's project for dealing with the whole question. If the disinfection can be successfully carried out at the mouths of the sewers, as a temporary measure, it may be asked why not do so permanently, and thus save the enormous outlay of the intercepting sewers, or of the embankment? The great number of the existing outlets is, no doubt, an objection to any such scheme of local disinfection; but there can no difficulty in connecting several of the minor outlets so as to concentrate the operations for disinfection in the smallest possible space. Mr. Wicksteed, in his Report of 1854, suggested four establishments of the same description as that at Leicester; adding, however, that there was nothing to prevent a further concentration or subdivision of the manufactories. Unfortunately, the official quackery of late years has cast Mr. Wicksteed's Report of 1854 into the shade, and the bad commercial results of the Leicester Sewerage Manure Company has indisposed the public to a fair investigation of the scheme. But certainly, at the present day, when, temporarily, the principle of that scheme is going to be applied, it would be worse than folly to neglect the consideration of the whole proposal made by that very able engineer. The great objection urged against any such local disinfection arises from the letter of the Metropolis Management Act; this, however, is now admitted by all parties to be so absurd as to require

extensive alteration, and it would be easy to introduce some provision which should at least allow the responsible authorities to exercise a sound discretion as to the points, or the manner, of discharge of the Sewerage. At any rate, we feel it to be a public duty to recall attention to Mr. Wicksteed's original propositions. His merits have been forgotten, whilst others have appropriated his plans, or applied the principles he was one of the first to propound.

We regret to observe that there is a tendency on the part of the Metropolitan Board of Works to call for Government assistance in dealing with the purification of the Thames. The river has been defiled by the acts and for the convenience of the dwellers on its immediate banks; and we hold that it would be a deliberate injustice to the other tax-payers of the country if the Imperial Government were to assume any large portion of the outlay necessary for the purification of the river. To some extent, no doubt, the Metropolis is entitled to expect national assistance in this work, for all the Government Offices, Docks, Palaces, &c., are exempt from the ordinary municipal burthens; but beyond the fair contribution on account of those buildings to the paving, lighting, sewer, watch, and poor-rates, we do not believe that the Metropolitan public is justified in asking for assistance from the State. Moreover, if the State should grant any assistance, it would be justified in interfering with the design and execution of the works; and the invariable failure of its measures, so far as Hydraulic operations are concerned, ought to "give us pause" before we invite such "uncanny" allies.

The very extraordinary attention bestowed upon Mr. Goldsworthy Gurney's scheme is in itself a bad omen for the future. That gentleman, in fact, proposes to form, on either side of the river, shelving shores, beginning at eight feet below Trinity High-Water Mark, and continued, with a width of 50 yards and an inclination of 1 in 12, towards the mid-stream. He then proposes to dredge two channels at the feet of these slopes, thirty yards wide each, to a depth of five feet below the present bed of the river; and he seriously asserts that such a state of things could be maintained without any very heavy outlay, whilst it would effectually prevent the formation of any extensive mud banks! Really it is surprising that such a scheme should have been listened to with seriousness, for it displays the most profound ignorance of the laws of Hydro-dynamics. In the first place, the deposition of mud does not depend on the transverse inclination of the bed of a river, but on the velocity of the stream by which that mud may be carried. In the second place, Mr. Gurney's double channel pre-supposes that the flood and the ebb tides invariably make against opposite banks of a river. Now, this is true of the Thames near the Houses of Parliament, but it is not true of that river in other parts of its course; for between London and Blackfriars Bridges the deep-water channel occupies nearly the centre of the bed, or, at least, both ebb and flood tides make with the greatest strength in a single channel. Oddly enough, no one has yet told the Committee of the House of Commons that the mud banks are mainly owing to the great variations in the sectional tidal capacity of the Thames, and, consequently, in its velocity at different points of its traject through London. Thus, the sectional area at high water was (in 1852) at Whitehall, 23,500 feet superficial; at Hungerford Market, 22,000 feet; at Waterloo Bridge, 21,000 feet; and the greatest velocity of the ebb-tide was 2·27 miles per hour. Opposite Bouverie Street the sectional area was, however, only 18,000 feet, and the velocity was increased to 2·854 miles per hour; whilst at Southwark Bridge the area was only 17,000 feet, and the velocity was 3·7 miles; and at London Bridge the area was 17,600 feet, with a tidal velocity of 3·903 miles per hour. How absurd it must then be to apply one uniform system under circumstances so essentially different! The velocities of the tide at Westminster and at London Bridges, for instance, are to one another as 1 to 1·72 nearly. Now Du Buat's experiments showed that when water flowed at the rate of 3·28 feet per second, it was capable of carrying forward flints as large as a hen's egg. The velocity of 2·27 miles per hour is equivalent to one of 3·32 feet per second, so that it is more than doubtful whether even at Westminster Bridge a slope of the materials dredged from the bed of the river could be maintained. Certainly those materials would be liable to constant change under the influence of the velocity at London Bridge, which is equivalent to about 5·72 feet per second. It would be utterly impossible to maintain the channels Mr. Gurney proposes to form, simply because the tidal current would remove the banks supposed to protect them; for it is important, also, to observe that if Mr. Gurney could concentrate the stream as he proposes in a narrow bed, the velocity must be correspondingly increased. Mr. Walker was, indeed, quite right in saying that the whole of this well-puffed scheme would be a failure.

What, then, is to be done? Most distinctly do we repeat what we have said before so often in other words, viz., that the common sense of the matter is to carry the sewerage of North London west of the Counter's Creek Sewer, and that of the southern bank of the Thames to the nearest point in the marshes, as recommended by Messrs. Bidder, Hawksley, and Bazalgette; and to erect disinfecting works both at the outlet of the sewers by which this is effected and at the outlet of the Counter's Creek. Substantially, this was the project Sir B. Hall rejected nearly two years since on faith of some absurd float tests by Captain Burstal. We are thus, after all this delay, driven back to the old scheme, and may we not then fairly hold Sir B. Hall and his advisers responsible for the consequences which may ensue from the existing poison-bed of the Thames? The only fault to be found with the Metropolitan Board of Works in this matter has been, that it lacked courage to assume a decided attitude in support of its own officers; but in the most unequivocal manner do we assert that the Board is far more likely to arrive at a proper decision in this important matter than any Government Department or any newspaper oracles. Great mischief has already been produced, much valuable time wasted, by listening to the crotchets of empirics and by yielding to the fancies of amateur engineers. The Metropolitan Board would set itself right at once with the public, and assume a vantage ground such as it never before occupied, if it, even at this late hour, decidedly adopted the scheme which has been so ably sketched for its approval by Messrs. Bidder, Hawksley, and Bazalgette. But it must act; and, above all things, it must avoid a repetition of the engineering blunders of the official advisers of the waste of money lately committed with the fond hope of abating the nuisance arising from the Thames. It is bad enough to be poisoned by the nuisances of our (formerly) noble river; but to be taxed at the rate of £1500, or even £150 a week, for the mere purpose of throwing into its stream a quantity of paste of lime, is simply "adding insult to injury!"

We are glad to observe that Mr. Bidder has protested against the adoption of Mr. Gurney's scheme; but we also regret that he did not state any of the philosophical reasons for so doing. Nobody is more capable of discussing this question than Mr. Bidder, and therefore it is that we should have wished to have seen him treat the investigation in a more scientific manner than has hitherto been adopted in its treatment. Mr. Bidder could also have "demolished" many of the ridiculous theories with respect to the influence of the withdrawal of the water from the upper reaches of the Thames; for no one is better acquainted than he is with the endless variety of the conditions affecting the hydrography of the Basin of the Thames. Unfortunately, the public is left in all these matters to the tender mercies of any bold quack who may gain the ear of the powers that be; perhaps naturally so, since the ablest engineers shrink from the noisy discussions going on in public. And so "Fools rush in where Angels fear to tread;" not that engineers are all angels, or the said quacks all fools, however.

ON THE IRRIGATION WORKS OF INDIA.

Third Notice.

The southern parts of India, the Madras provinces especially, present one remarkable difference in the conditions of their physical geography from those which prevail in the more northerly provinces. This difference arises principally from the nature of the mountain chains which feed the heads of the rivers, or watercourses, and from the consequent peculiarities of the regimen of the latter. In the northern provinces, for instance, the great rivers, the Jumna and the Ganges, with their affluents, flow frow the snow-clad ranges of the Himalaya, and are thus far more constant in their volume than rivers ordinarily are in such latitudes; and, indeed, as the melting of the snow takes place at the periods when there are no rains, it, to some extent, compensates for the want of the latter. But the south Indian rivers, the Godavery, Kistnah, Pennar, Cauvery, &c., only take their rise in the moderately-elevated Western Ghauts, and the length of their courses is always far inferior to those of the more northerly streams; so that not only are they entirely dependant upon the monsoons for their great supply of water, but the number of their afflu-

ents is necessarily small; and, moreover, the physical characters of the basins of those affluents are not sufficiently varied to admit of their acting in any manner to equalize the flow of the main stream. Perhaps, also, in noticing these considerations connected with the physical geography of the Madras rivers, attention ought to be called to the fact that their deltas, or the alluvial plains near their embouchures, are of infinitely smaller proportions than the deltas of the Ganges, of the Indus, or of the Irawaddy. The channels of the Godavery, Kistnah, and Cauvery, indeed, are formed in the hilly districts, or, more correctly speaking, in the elevated plateau of southern India; nor do their alluvial plains commence until they approach within about 70 miles of the sea.

Amongst the official documents we have been able to procure for the purpose of preparing these notes, we have not been able to find any scientific description of the hydrography of the Madras rivers; but, from several passages in the account given by Colonel Baird Smith of the irrigation in the Madras provinces, we believe that the upper portions of those streams must have lost their torrential character long before they arrive at their present deltas, and that they must flow with a moderate velocity over clayey or loamy deposits, or over other easily-decomposed formations in the frontier districts of the elevated plateau. The nature of the alluvial plains, and even the very character of the river-beds described by Colonel Smith, proves, indeed, that on leaving the last spurs of the higher lands, the Godavery, Kistnah, and Cauvery must carry forward considerable quantities of alluvial matter in suspension; and somewhat of the same process appears to be still going on at the mouths of these rivers as, at some long antecedent period, took place at the head of the Bay of Bengal. The various deltas are slowly advancing seawards, though the littoral currents must retard their progress, and perhaps may oppose an ultimate limit to their extension. In the meantime, the alluvial plains which actually exist present the ordinary conditions of level to be observed in deltas, and their cross-sections are characterized by the usual elevation of the bed of the main stream, with the long, gently-inclined planes falling away from it on either side; they may be rudely described, in fact, as representing huge natural ridges and furrows, wherein the river occupies the elevated ridge. Sometimes the waters seek to form for themselves a lower course; whilst the rivers are almost always divided into a series of smaller branches as they approach the embouchure, and have lost the velocity necessary to carry them forward in their original direction. The great deposit of alluvial matters takes place at this part of their course, and it gives rise to the low, flat foreshores which characterize the Madras coast in so many places, and which, unless drained, or regulated by the hand of man, so often degenerate into pestilential swamps. The very richness of the soil thrown down at the mouths of all rivers with deltas is, in warm climates especially, a source of evil to man, if left to itself; but the peculiar nature and configuration of these districts often render them, when properly and skilfully cultivated, the most fertile and valuable regions of the globe. In the Madras deltas, nearly all that was required was the intelligent application of the very waters themselves, which, when allowed to run riot over the country, or to waste their fertilizing influence in channels which served no good purpose, were positively injurious. The great works described by Colonel Smith as having been executed at the embouchures of the Godavery, Kistnah, and Cauvery, by the officers of the Madras Irrigation Department, appear to have effected all that could have been expected from them under their peculiar circumstances; and they merit examination by European engineers, perhaps as much on account of the hydrographical questions they raise, as on account of the politico-economical benefits they certainly have produced.

Beginning, then, with the Cauvery, in the footsteps of the gallant and truly noble author so often quoted, we find that the Irrigation Department of Madras, under the energetic guidance of Colonel Cotton, has provided for the useful application of the waters brought down by that stream, by means of a gigantic dam thrown across the river at the head of the small island of Seringham, where the main stream divides into two branches, known respectively by the names of the Coleroon and the Cauvery proper. No doubt the Cauvery proper was, as its name would imply, the original bed of the river; but in the course of time it must have been raised by the gradual accumulation of alluvial matters, and, on the occasion of some flood, the waters must have sought the lower level of the plain of the delta, at the foot of the higher lands, separating the water-shed of the lower end of the Vellaur from that of the Cauvery. The peculiar character of the respective branches of the latter river did not escape the notice of the native engineers, and, long before the English appeared in India, a system of rude irrigation works was carried into effect both in the Tanjore and the north-eastern part of the Trinchinopoly districts. But the works executed by the natives were inadequate to counteract the great natural causes at work to disturb the supply of water to the two branches of the river; so that, when the East India Company's engineers began their operations, they found that the bed of the Coleroon offered an outfall to the upland waters so much more favourable than that of the Cauvery, that there was even a probability of the latter becoming eventually useless as a means of irrigation for the great region it must at one time have supplied. The operations of the English engineers in the beginning were hardly more scientific than those of the natives had been; and they seem, indeed, throughout to have rather been of the character of empirical experiments than the result of careful deductions from the known laws of hydraulics. However this may be, the experiments tried have succeeded remarkably well; and, by means of the dams across the two branches of the river, of the various under-sluices and overfalls, and of the channels cut at the heads of the minor courses of the Cauvery near the sea, the whole system of irrigation of the district has been brought under control. It would be impossible to describe here the various works executed for this purpose; nor would it be necessary so to do, because Colonel Smith has already related their history in more elegant terms than any we could use. For our present purposes it will suffice to say that the result of the labours of the various officers at the head of the Irrigation Department in this valley has been to secure the fertility of not less than 716,524 acres, by means of the distribution of 16,875 cubic feet of water per second; or, in fact, by the application of nearly all the water brought down by the Cauvery during the dry season. Colonel Smith states that the total expenditure for original works has been only £91,874, and that the net annual returns have been, on the average of the years between 1836 and 1850, not less than £21,448 per annum, or about 23½ per cent. Our English Central Government works, alas! are very far from yielding equally satisfactory results; and it must be borne in mind that, whilst the Indian Government was thus benefiting itself, it was adding immeasurably to the comfort and happiness of its subjects. The extent, indeed, to which the latter object of the labours of a good government has been advanced by the irrigation works on the banks of the Cauvery, may be judged by the mere facts that the population of the Delta of the Cauvery is not less than 430 per square mile; and that the irrigation works have placed their means of subsistence almost entirely beyond the influence of a dry season.

We cannot leave this part of our subject without expressing our regret that the Indian engineers should have neglected to adopt the movable system of barrages, or dams, applied originally by M. Poirée upon the Seine, and subsequently by his colleagues, the French engineers, to the other rivers of France; because we believe that the silting of the upper part of the river might be more easily and more effectually checked by the use of these movable dams, than by the under-sluices which appear to be the fashion in India. Another reason for regret, as to the incomplete nature of the works on the Cauvery, is to be found in the utter annihilation of the navigation in the portion of its course through the delta. It would have been easy to have converted one of the ancient smaller mouths of the Cauvery into a navigable canal; and the comparative deficiency of roads in this highly fertile district appears actually to be one of its principal evils. In fact, although the works for improving the irrigation of the Delta of the Cauvery have been eminently successful, they are especially exposed to our criticism, of having been conducted almost entirely by empirical experiment, and of overcoming difficulties by brute force rather than by the application of science. The results obtained by the Irrigation Department in the Madras provinces, generally, may be equal to those obtained in the north-western provinces; but the means by which they have been so obtained are far less worthy of admiration.

The irrigation works of the Kistnah, like those already described upon the Cauvery, are confined exclusively to the portion of its course comprised within its delta; for it is worthy of remark that, unlike the inhabitants of the Alpine

regions of Europe, the dwellers in the hill countries of India do not appear to attach much importance to the use of water as a necessary detail of their agricultural operations. The Kistnah rises in the high lands of the Western Ghauts, and has a course of about 600 miles in length, nearly west and east, receiving several affluents from the plateau of Hyderabad; but as it does not receive the drainage of any mountain chains covered by perpetual snows it is necessarily exposed to great variations in its volume, for it is solely dependant upon the monsoons, and upon the springs in its bed, for the water it conducts to the sea. At a place called Bezwarah the river quits the hills, and flows, for the remaining 70 or 80 miles of its course, through the alluvial deposits of its own delta, and so near to the outfall of the Godavery that the slopes from the elevated ridges of the two streams meet to form the pestilential Colair Lake. At Bezwarah the channel is narrowed to about 1300 yards in width, and the depth of the water varies there from 5 or 6 feet, in the dry season, to 30 or 40 feet in the monsoons; the average fall of the river towards the sea is about 12 inches per mile, whilst the transverse fall of the land from the ridge occupied by the stream towards the low lands on either bank is about 18 inches per mile. Advantage has been taken of these conditions to establish a dam; and by fixing its crown at 14 feet above the ordinary summer level, to enable the water to be distributed over a wider area of country than would naturally be supplied. Colonel Smith observes very truly, that the construction of a permanent solid dam across the bed of a river carrying down much alluvial matter, must eventually raise the bed itself, and the ultimate result of the works thus executed at Bezwarah must be to materially affect the hydrographical conditions, not only of the delta, but also those of the upper parts of the river, unless a permanent outlay be incurred for the purpose of removing the accumulations of silt. A modification of the Poirée dams might have been introduced here also, with, we believe, considerable advantage to all parts of the hydrographical basin.

The dimensions of the Kistnah Dam are really gigantic when compared with similar works in Europe. Its length is 3750 feet, its width 305 feet, its height 21 feet above the ordinary deep water bed, and 14 feet above mean summer level; it is constructed principally of loose rubble stone, but the waste-board is executed of dressed masonry; there are no bottom sluices. The water thus retained and raised is distributed by means of feeding channels on the right and left banks respectively, capable of discharging through each of them the quantity of 3500 cubic feet per second; or the total quantity of water distributed is sufficient, according to the usual Indian calculations, to irrigate permanently not less than 280,000 acres. If we suppose that the watered lands under cultivation bear the ordinary proportion to the other descriptions of tillage, it follows that the operations upon the Kistnah have secured the fertility of at least 840,000 acres. The estimated cost of the completion of all the works is about £200,000, and the total gain to the Government is considered by Colonel B. Smith to be at least £60,000 a year, or about 30 per cent. These figures, we confess, look almost "too good to be true!"

In addition to the principal dam and the distributory canals, the engineers of the Kistnah irrigation contemplate the restoration and the extension of the system of tanks originally constructed by the native engineers for the purpose of storing the flood-waters of the monsoon season. The river is essentially a torrential one; and really the execution of a series of works of the proposed description must be necessary to equalize the flow of water, and to moderate the effects of the occasional floods in the low lands. In this delta also, as in that of the Cauvery, it might be desirable to provide some means of artificial navigation; but the Indian engineers have still to learn that it is impossible to combine efficiently works for irrigation and navigation. There would appear to have been prepared some projects for a canal with this double object, notwithstanding the practical lessons afforded by the results of similar works elsewhere, or even in India itself. Perhaps, after all, now that railways have so effectually destroyed the importance of other means of communication upon the great lines of traffic, it would be folly to construct new canals; and Brindley's saying that "Rivers were only made to feed canals" may be more justly modified to this, that "Rivers were principally designed to supply irrigation." The misfortune in India has been that the Department of Public Works requires such an amount of theoretical perfection in the construction of the railways it sanctions, that it is almost impossible to attempt them in districts of only a secondary importance. To a certain extent the Indian public works are retarded by the red tapeism of the Administration. Fortunately, however, the said Administration has been singularly well-conducted hitherto, and its operations have been productive of infinite good to its subjects, as well as of profit to the well-abused East India Company. We cannot say the same of the Dowbs, Phipps, Somersets, &c., of our native English Brahmins; and yet it is coolly proposed to transfer the powers so well used by the East India officers into the hands of our incapables!

Circular to Gas Companies.

THE parliamentary inquiry into the gas supply of the metropolis proceeds but slowly. There have been two more sittings of the committee since our last, but only two additional witnesses have been examined, and at the present rate of progress the end of the session will arrive before the inquiry is half finished. There is now scarcely a probability of any report from the committee, and much less of any legislative measure on the subject being passed this year.

A great portion of the time of the committee has been occupied, not to say wasted, with the re-examination of Dr. Challice. On the first day he showed clearly enough that he knows little or nothing about the matters on which he volunteered to give evidence, but the committee seemed to enjoy the fun of exposing his ignorance, and would not part with him till he had laid it all bare. This he did most completely. Coming forward as the chairman of the association for the protection of the interests of the gas consumers of South London, to apply for the protection of Parliament against the monopoly of the gas companies, he declared that he knew nothing of the provisions in the existing Act of the Surrey Consumers' Company, against the conduct of which company he most strongly complained; and he seemed quite astonished when informed by the committee that the consumers already possess all the protective measures they require. He was, indeed, aware that there was a fixed maximum price, but he had not looked into the Act to see the amount. He had satisfied himself with imagining that it must be 4s., the price first charged, and when the price was raised to 4s. 6d. he was at a loss to account for that supposed contravention of the Act, but imagined that it was brought about by some juggle between the trustees for the consumers and the company. He was surprised when told that the maximum price was 6s.; he did not know that the company were bound by penalty to maintain the gas at a given standard of quality; he did not know that power was given to certain public bodies to appoint an inspector of meters; and he did not know that they might also appoint a tester of the quality of the gas. On all those points he was enlightened and surprised by the committee. But, though totally deficient in knowledge of those practical matters, he was not wanting in suggestions for the guidance of the Legislature, and he indulged the committee with some of the speculations of his fancy. He suggested that a maximum price of 3s. might be a proper standard; and, though he admitted the gas companies, when in competition, were losing money by a charge of 4s., he conceived that, with increased facilities for conveyance and with the possibility of an abundant supply of good gas coal being obtained from the London clay, the sum of 3s. would be a sufficiently remunerative price. The medical officer of health for Bermondsey having for a day and a half afforded good sport to the committee, and seriously prejudiced the case of the grievance-mongers, was permitted to depart to receive the thanks of the gas companies for the service he had rendered them by his evidence, and to congratulate the members of "The South London Gas Consumers' Mutual Protection Society" on being already in possession, without knowing it, of all they desired Parliament to give them.

The next witness, Mr. W. Crosley, the gas-meter manufacturer of the Southwark Bridge Road, was of a very different stamp from Dr. Challice. No one can doubt his practical knowledge of the subject on which he gave evidence, though there may be doubts as to his discretion in volunteering to impart his knowledge in support of such a cause. Mr. Crosley may have been somewhat neglectfully treated by the metropolitan gas companies, who have not given his improved meters the encouragement they deserve; and the natural desire

to take such an opportunity of bringing them into notice and of pointing out their excellence may have induced him to come forward in the manner he has done. Whatever his motive, all parties have reason to thank him for the information he afforded respecting the action of the meters generally used in London. Mr. Crosley has, indeed, placed the inquiry in a new light, and has shown that the point on which the agitators laid the least stress is the one that most requires attention and legislative interference.

It cannot for a moment be supposed that the highly respectable directors of the metropolitan gas companies would be knowingly guilty of defrauding their customers by false measures,—for that would, in fact, be the case were they to connive at a practice of over-filling the meters, with a knowledge that its effect would be to make the quantity registered greater than its real amount. We fully agree with those of our contemporaries who have noticed the gas inquiry, that no expressions of condemnation would be sufficiently strong against men who could so disgracefully conduct the business of public companies. But the improbability of their having so acted increases in proportion to the moral turpitude of the act; and, by thus forcibly showing the disgraceful character of the fraud, if perpetrated, our contemporaries at the same time show that its committal by men of high reputation and standing in society is most improbable. Mr. Crosley, indeed, fully exculpated the directors and the companies generally from any imputation of an intention to defraud, and he expressed his conviction that the registration of a larger quantity of gas than passed through the meters has been entirely unintentional. As far as the companies are concerned, he said, "I believe it is to their interest to have accurate registration. I conscientiously believe that there is not a company who knowingly do commit a fraud, or would countenance a fraud if they knew it was committed." And, again, he stated: "I believe the companies, as companies, are entirely innocent of any intention to defraud the public. I believe they do not know of these liabilities to error, and I think that this is one way of drawing their attention to the subject."

Though it was manifest from the tone of Mr. Crosley's evidence that he considers himself to have been ill-treated by the gas companies, there was little in his statements, taken collectively, to which they can reasonably object. He pointed out an error that has arisen from a mistaken notion, and if that error has unintentionally been the means of giving short measure, the directors as honest men ought to be glad to have it thus pointed out. No sooner, indeed, was it made apparent by Mr. Crosley's evidence that great irregularities existed in the registration of the meters, than Mr. Henry, on behalf of the gas companies, consented to the appointment of meter inspectors to watch over the interests of the gas consumers, and thus to remove that ground of complaint.

From the false position in which Mr. Crosley placed himself by volunteering his evidence, it might be supposed that he was inimical to the metropolitan gas companies; he was therefore treated as a prejudiced witness, and was subjected to a style of cross-examination by some members of the committee which his mode of giving his evidence did not justify. He had evidently listened too readily in some instances to malicious gossip, but it was apparent that he stated nothing that he did not believe to be true. His complete exoneration of the gas companies from connivance in the alleged incorrect registration of the meters sufficiently proved that he would not allow any lurking feeling of annoyance he might entertain towards them to stifle a declaration which he believed truth and justice required.

There is, however, no doubt that a liability to abuse exists, and that a remedy must be found. It is suggested that this may be effected by officers specially appointed to test the accuracy of all gas-meters, but experience has shown that this system is at best very imperfect and unsatisfactory in its operation, in consequence of the difficulty encountered in finding persons to fill the office who are perfectly unbiassed and free from favour towards one manufacturer or the other. Of this the meter inspector appointed by the City of London is a well-known example, and we could cite others. The testing of a meter does not require any large amount of mechanical knowledge or skill, or more than may be acquired in a few hours by any intelligent man; the great point for consideration is as to how he shall be provided with suitable instruments of undoubted accuracy. It is within our own knowledge that what is called a cubic foot by one manufacturer differs something like 3 per cent. from the cubic foot of another, and that few of them accord with the standard fixed by law with that accuracy which should characterize such instruments. The State has already provided standard weights and measures for ordinary purposes, and it ought also, in our opinion, to provide forthwith a standard apparatus for measuring gas, of which duplicates should be made by authorized agents. This, and the measures sketched out in the following outline of the provisions to be embodied in any legislation on the subject, would, in our opinion, meet the necessities of the case, and be sufficient to rectify the existing abuses.

"The inspectors of weights and measures in any city, borough, parish, township, or district which is lighted with gas, shall be *ex officio* inspectors of gas-meters within their respective jurisdictions, wherever no inspector shall have been already lawfully appointed. The fees of the inspectors shall be fixed by the justices or other persons by whom they are appointed.

"The Board of Trade shall cause to be constructed a standard testing gasholder, to contain a certain number of cubic feet, and shall appoint a person or persons to manufacture duplicates thereof for the use of inspectors and manufacturers of meters, and of gas companies.

"The Board of Trade shall issue instructions for the guidance of meter inspectors, and may from time to time alter and amend the same, and the inspectors shall communicate copies of all such instructions to the gas companies in their respective districts.

"The inspectors shall not certify any meter as being correct the registering index of which shall, under any circumstances, vary more than 2½ per cent. above or 2½ per cent. below the register of the testing gasholder; and every gas company shall be bound to allow any meter to be fixed and used in their respective districts which the inspector thereof shall have certified as indicating the quantity of gas passed through it within the limits of deviation before mentioned.

"Appeals may be made to the Board of Trade by any gas company or by any meter manufacturer against the decision of any inspector, when, by reason of such decision, the use of any particular description of meter shall have been prohibited on the ground of its being so constructed as to be liable to be tampered with in such manner that the index may register more or less gas than shall have actually passed through such meter, or on some other equally substantial ground of objection.

"Appeals may also be made to the Board of Trade by any gas company against the decision of any meter inspector whereby a meter is certified as correctly registering the quantity of gas actually passed through it, within the limits of deviation before mentioned, and it shall appear to the company that such meter is liable to be tampered with in such manner that the index may register less gas than shall have actually passed through such meter.

"The Board of Trade shall decide all such appeals, and their decision shall be communicated to all meter inspectors for their guidance. The costs of all appeals shall be paid as the Board may direct.

"The inspectors shall have at all times, on the application and at the expense of any consumer of gas supplied by a company, a right to inspect the meters erected by the company in the premises of the person making such request, after giving forty-eight hours' notice of such intended inspection to the company, or their manager or clerk; but before such inspection the person requiring such examination shall deposit in the hands of the inspector all money due, or appearing to be due, by such person to the company; and in case such consumer shall have paid any sum in excess, such excess shall be returned to such consumer."

We throw out these hints for the consideration of all parties, with the conviction that it is to the interest of them all to have the matter placed on a basis which, while it corrects one class of abuses, will prevent the development of others, and secure as far as practicable justice for every interest.

The action in the Court of Queen's Bench brought by Mr. F. C. Hills against the Equitable Gas Company for an alleged infringement of his patent for the purification of gas by the peroxide of iron, was set down for trial yesterday before Lord Campbell, and the case had been partially opened by the Attorney-Ceneral when Lord Campbell interfered and suggested that the action against the London Gas Company, for which the Court of Exchequer had granted a new trial, should be first disposed of, and that in the meantime the proceedings

in the action against the Equitable Company should be suspended. This course was, after some discussion, assented to by the plaintiff, and it is probable that the trial may take place at the approaching Surrey Assizes. Mr. Hills himself must now be convinced that our remarks on this multiplicity of litigation were not uncalled for or unappropriate.

Register of New Patents.

2782.—Mathieu François Isoard, of Paris, engineer, for "*Improvements in producing heat and light.*" Patent dated Nov. 2, 1857.

This invention relates to carburetting and burning the vapour of water, in order to render it applicable for heating and lighting purposes. The vapour is produced in any kind of generator, or it may be the steam as it leaves the cylinder of steam-engines; this vapour or steam is caused to be superheated and to traverse in a carburetting apparatus, in which it is charged with gaseous hydrocarbon, which it carries away. On leaving this apparatus it is passed under the bars of a furnace, in which it serves as fuel. The vapour of hydrocarburet burns, and the steam arising from water also burns, after having been decomposed into hydrogen and oxygen.

Instead of conducting it under a fire grate it may be conducted into a gasholder, whence it can be allowed to escape at pleasure, and burnt like gas used for lighting purposes.

The preparation of the hydrocarburets to be used are varied according to the purpose required. For steam intended to use as fuel, heavy tars of all kinds are used; and for gas for lighting purposes, hydrocarburets are used.

Thus the steam leaving a boiler or generator of any kind, even after it has been used for inducing the action of an apparatus, is passed through a worm-eater, or any other suitable apparatus, in which it is superheated to a high temperature, and then caused to enter a carburetting apparatus.

The claim is for "*carburetting*" superheated steam, effected by causing the superheated steam to traverse hydrocarburets of any kind, this carburetting furnishing, according to the mode of operating and the carburets employed, gas for lighting or for heating purposes.

2797.—Richard Laming, of Hayward's Heath, in the co. of Sussex, for "*Improvements in purifying gas, and in apparatus useful for that purpose.*" Provisional protection only obtained. Dated Nov. 4, 1857.

This invention relates to the double-diaphragms scrubber, or washing vessel, described in the specification of the inventor's patent, dated Feb. 3, 1857, and improves upon it, by substituting for the small holes for minutely dividing the gas in the washing liquid other arrangements for establishing a perfected system of wave or surface washing (sometimes to be combined with ordinary scrubbing or washing), the object of the invention being not only to purify or wash the gas with a minimum quantity of the liquid used, while no greater resistance is in any case opposed to the free passage of the gas than may suit the circumstances of the particular works, but also to reduce the current of impure gas to a thin stratum, it being at the same time brought into contact with a flowing stream of purifying liquid, which also occupies great area, but is nevertheless so confined within channels as to be less liable to stagnate in its course than in the case of the former double-diaphragms scrubber.

2815.—Frederick Lipscombe, of the Strand, London, for "*Improvements in the mode of conveying water and other liquids.*" Provisional protection only obtained. Dated Nov. 6, 1857.

This invention consists in laying down, in a peculiar way or ways, one or more channels of iron, brick, earthenware, or other material, from any point or points to any other point or points having a lower level, in order to elicit a large proportion of the hydrostatic pressure, due to the difference in height of the levels, that the water or other liquid may rapidly flow through the said channel or channels; and this is effected by carrying such channel or channels a short distance in an abrupt fall or abrupt falls, then a considerable distance in a horizontal line or nearly so, and afterwards, if necessary, another abrupt fall or falls are employed as before, and so on.

In applying this invention for the purpose of draining bog or marsh land, it is proposed to form a series of receptacles into which the land-water can readily flow; the receptacles being connected together and by means of this invention, above described, or by means of a horizontal line of pipe or channel, the water from the whole of them may be readily carried off.

2822.—John Fordred, of Stoke Newington, Middlesex, gentleman, for "*Improvements in heating and purifying water.*" Patent dated Nov. 7, 1857.

It has long been a desideratum to purify, sweeten, decolorize, and otherwise operate on water intended for domestic, dietitic, and manufacturing purposes, which, either from its mode of collection, procuration, or its source, is ill-favoured, contaminated with organic matter, or otherwise unsuitable for the purposes intended.

Now, the patentee has discovered several modes of effecting these results in an economic manner, by the use of carbonate of lime and sulphate of lime (both natural and artificial), coke, burnt clay, wood charcoal, and pumice stone.

In the adoption of any one or more of the filtering or decolorizing materials named in this specification, regard must necessarily be had to their prime cost in the situation where the operations are to be carried on on the large scale; this will, in a great measure, influence the selection made. I shall therefore describe, in general terms, the mode of using each of those named, leaving the selection of any one or more to be determined in each particular case by the facility of their procuration in the immediate neighbourhood, or their relative prime cost on the spot.

The coke and wood charcoal are used alone in the form in which they leave the kilns or ovens. Being of a porous nature, they are used for the formation of a filtering-bed in the ordinary way, without breaking them up, so that, when their power is exhausted, they can be removed, washed, dried, and sold for nearly their original cost; if desired, the coke may be reburnt and used again

In operating on turgid or coloured water, coke, and by preference, railway coke, as free from sulphur as possible, is employed as a decolorizer and filter.

Burnt clay may be employed in some localities with advantage, on account of its economy.

Pumice stone is also available.

Carbonate of lime or chalk may be used in the proportion of about two ounces to the gallon. This may be mixed and allowed to subside. A fresh quantity of carbonate of lime may then be added, and the operation conducted as before, and this may be repeated fifteen or twenty times.

Finely-ground limestone may also be used as the foregoing.

If it is desired that the water should be hardened, so as to prevent its action upon lead, then the patentee introduces sulphate of lime or gypsum in the formation of the filter-bed.

To render distilled sea-water drinkable, the patentee proposes to conduct the water from the condensing apparatus through a vessel containing a layer of granular limestone or marble and a thin stratum of granular gypsum, and filled up to the top with animal peat or wood charcoal, the proportions being about 12 of charcoal, 1 of gypsum, and 22 of limestone or marble.

2885.—Richard Archibald Brooman, of 166, Fleet Street, in the City of London, for "*Improvements in gas-burners.*" Patent dated Nov. 17, 1857.

The invention consists in surrounding the central ring of orifices for the escape of gas of an argand gas-burner by an additional ring of lesser orifices, which are placed equidistant from the central ones as well as from each other, and about six of these will be found to answer a good purpose. The inventor has discovered that by this arrangement the smaller flames obtained in burning the gas produce upon the central and greater ones the remarkable effect of obviating all flickering and smoking, so that the argand may be burned at its maximum height without the use of a chimney.

The claim is for the combination with an argand burner of a series of supplemental jets, arranged around the said burner in the manner and for the purpose hereinbefore described.

3074.—Adam Baird, of Finchett House, near Liverpool, merchant, for "*Improvements in regulating the supply of water and other fluids for domestic and other purposes.*" Provisional protection only obtained. Dated Dec. 14, 1857.

To carry out this invention it is proposed to carry the water to the top of the house by means of a service-pipe from the main into a cistern, from whence the water, after having filled the cistern, is conducted to a cistern upon the next lower level, and from thence to the next floor or level, and so on to all the floors in the house where water is requisite; the supply being regulated by means of a ball-cock and valve. The whole of the cisterns are in connexion with the regulating cistern, so that when one becomes short of water an action takes place in the regulating cistern which causes it to be filled again.

3095.—Montague John Turner and Marcus William Turner, of Woodcote, in the co. of Surrey, esquires, for "*The improvement of conduit-pipes and tubes for sewers, drains, conduits, gas, and other purposes.*" Provisional protection only obtained. Dated Dec. 17, 1857.

The manufacture and moulding of glass into conduit-tubes, pipes, and drains, water-closet pans and pipes, and casting and moulding variegated glass into mantel-pieces and cornices. From the indestructible nature of glass and the resistance it offers to all decaying substances and time—being totally exempt from corrosion or absorption—and from its exceedingly smooth and hard surface not admitting of obstructions, furring, or secretions, as at present found to prevail in brick courses, iron and earthenware pipes would always be kept clean with an ordinary supply of water. For sewerage and gas-pipes this would be found of inestimable value as a sanitary measure alone, because with glass there can never be any escape or leakage of either obnoxious and unwholesome matter or liquid, or the emission of any effluvia whatever. No absorption could take place in the surrounding earth of the deleterious liquids which do largely escape from the sewers at present, and are found to impregnate the various wells, especially in the metropolis, rendering the water unwholesome and unfit for human consumption. Bricks and iron decay and rust, and in no very lengthened period waste into holes, and then become choked up and infested with rats: in warm weather their pernicious essences rise into the air. Strong glass will be found to obviate all these defects, and to resist also the ravages of time, and may be as easily inspected, if required at any time, as the iron tubing or brick courses, the joints being merely cemented and fitted with slight shoulders one into the other of easy lengths. They would be found as little liable to break as iron tubes at present in use, and less expensive, and never to wear out. As regards its use for water-closet pans and pipes, it would be kept easier clean and free from fur, and not at all liable to crack in frosty weather. For water-tanks and pipes its advantages would be very great, inasmuch as it could be kept clean with so little trouble and care.

3124.—William Bough, 1, Jewin Crescent; Cripplegate, for "*Improvements in lamps and wicks for burning rosin and other oils and fluids, parts of which improvements are applicable to argand gas-burners.*" Provisional protection only obtained. Dated Dec. 19, 1857.

That part of the invention which relates to the improvement of argand gas-burners where a button is used, consists in forming the said button of talc.

3136.—William Basford, of 15, Lowther Cottages, Liverpool Road, Islington, in the co. of Middlesex, engineer, for "*Improvements in the manufacture of gas and in retorts and other apparatus to be used therein.*" Patent dated December 21, 1857.

The substance of this invention, exclusive of the apparatus employed, which seems to be of a very complicated character, consists in the use of a retort, divided longitudinally into two compartments, but communicating with each other at the back, and named by the inventor a "twin retort." In making gas he commences by charging one compartment, and allows the carbonization to go on until about half completed. He then closes a valve, through which the gas has made its exit, and charges the other com-

partment, the effect of which is to cause the gas evolved from the charge last introduced to pass by the back over the semi-carbonized and more highly heated charge in the first compartment. The valve before shut is again opened, and the gas is conducted to a purifying apparatus, for which the inventor obtained a patent (No. 1099, May 9, 1856). From thence it is conveyed to the gasholder in the usual manner.

The claim is for—

1. The method herein described of manufacturing coal gas.
2. The twin retort.
3. The receiver.
4. The hydraulic chest and fittings.
5. The combination of the valves with the outlet-pipes, shafts, and levers.
6. The combination of the several vessels, chambers, chests, valves, levers, and other apparatus herein described, and for the purposes set forth.

3178.—THOMAS SPENCER, analytical and consulting chemist, of 21, Southampton Place, or, as recently designated, No. 192, Euston Road, London, for "*Improvements in the purification of illuminating or lighting gas.*" Patent dated Dec. 29, 1857.

In the provisional specification it is stated that to effect the said purification the inventor employs, in the first place, the iron ore known to mineralogists as the "spathose ore," which substance may be used in lumps or in a granular state and while moist. The ore is found in several parts of this country and on the continent of Europe, and is a white, cream-coloured substance, known to chemists as a carbonate of the protoxide of iron. The inventor has discovered that it possesses the property of absorbing sulphur from ordinary carburetted hydrogen or illuminating gas. To effect this object, it is only necessary to place the ore in any of the well-known forms of purifying apparatus, and then cause the gas requiring purification to pass through the same. The operation will be best understood, however, by those practically engaged in the manufacture of gas, when it is stated that the form of apparatus preferred is in all respects analogous to that used in the process of purification by means of dry lime. The ore itself may be placed in the purifier in lumps, or granular, or in powder, but the patentee prefers to use it in a state of granulation analogous to that of coarse gunpowder. During the process of purification, it is necessary that the ore should be kept slightly moist, which applies equally to the other substances named in this patent.

When the sulphur has been absorbed from the gas the colour of the ore in the purifier will have changed from cream white to black, the intensity of the latter denoting the amount of sulphur absorbed. As soon as the ore has passed into this state it is to be removed, and a fresh charge substituted.

In the second clause of the patentee's provisional specification it is stated that the black magnetic substance which results from the calcination of the spathose ore will also effect the purification of illuminating gas.

Though the same substance will be produced on roasting the ore in the open fire, yet the operation is best and most economically performed at a very low red heat in ordinary gas retorts. In performing the process of purification by these means with this substance, it is only necessary that it should be placed in the well-known purifying apparatus already referred to, and the gas be made to pass over or through the same in the ordinary manner practised in the process of purification by dry lime, the oxide being kept slightly moist during the operation.

The third clause of the inventor's provisional specification states that any ore, or sand, or substance containing ferruginous matter in a magnetic state, or any substance not naturally so, but which by treatment may be reduced to this state, is also available for the said purifying purposes. The substances there referred to are magnetic ores and ferruginous sands, and also a magnetic substance obtained by calcining the well-known hematite or peroxide ores along with carbonaceous matter.

With regard to the natural magnetic ores, the patentee has discovered that many of them are capable of absorbing the sulphur from impure gas; though, as in the case of the other ores named, the operation is more effectually performed after they have been subjected to a process of roasting or calcination. To render non-magnetic ferruginous sands and hematite ores magnetic, and thereby available for these purposes, it is necessary to calcine them in retorts along with coke, charcoal, anthracite, or, in fact, any carbonaceous matter, care being taken during the operation not to apply more than a low red heat, to prevent the reduction of the ore. It may be necessary to explain that in the course of this calcining process a proportion of the oxygen belonging to the ore combines with the carbonaceous matter, and is given off as carbonic oxide. When this gas ceases to be formed, which is easily ascertained by having a small stop-cock in front of the retort, the process of converting the peroxide into the magnetic state is complete, and, on cooling, the converted ore may be removed for use in the purifier.

In practice the inventor finds that from 10 to 12 per cent. of carbonaceous matter mixed with raw ore is sufficient to effect its reduction to this state, and mentions that a larger portion of carbonaceous matter may be used in this process, as any excess may be made available for a succeeding operation.

When the ore exists in large lumps, the inventor prefers that it should be crushed or granulated previous to its being placed in the retorts. In the purifying operation any of the substances named may be used alone or in combination with any other substance that may be found convenient. For example: should it be required to use the spathose ore or magnetic oxide in a state of fine powder, in order that the impure gas should freely permeate beneath the surface of the mass, it may be necessary to mix it with a coarser material, such as sand or sawdust. Moreover, when the spathose ore is used in the raw state, the patentee prefers to mix it with a small proportion of caustic lime, to absorb any carbonic acid liberated from the ore by reason of its combination with the sulphur of the impure gas. It is now important to state that when any of the above ferruginous substances become saturated with sulphur in the purifying operation, each of them may be made to repeat the process without limitation. To effect this desirable object with economy, the spent substance is to be placed in a retort and subjected to heat sufficient to distil off the sulphur which may be collected in a molten state from the retort and used as ordinary sulphur. At the close of this operation the ferruginous substance, on cooling, may be placed in the purifier and used as before. Moreover, when again saturated, the sulphur may be again distilled off any number of times. In this revivifying operation the inventor prefers to use earthenware retorts, though those of iron that have become coated with carbon answer the purpose very well.

The patentee wishes it to be understood that no claim is intended to be advanced by him for this mode of distilling sulphur from any refuse or spent purifying media already known. On the other hand, the mode is claimed by him when applied to the renovation of the spathose or magnetic ore or magnetic oxides however obtained, the application of which substances for the purification of illuminating gas is here, to the best of his knowledge, made known for the first time.

The inventor states that he is already aware that a ferruginous oxide prepared from a salt of iron is used by some in the purification of gas. This substance has been improperly designated or described as a "carbonate of iron," meaning thereby a carbonate of the peroxide of iron, but which body has no practical existence. On its formation the substance intended is, in reality, a hydrated peroxide of iron, but which loses its constitutional water on the application of intense heat, and is then a peroxide only, and which is characterized as not being attracted by the magnet.

No claim is made for the method or manner of performing the process of purification, but what is claimed is this application of the white spathose ore to the purification of illuminating gas; also, the application of the magnetic oxide of iron, in either its native or artificial state, to the same purposes. The patentee adds, in conclusion, that where he is enabled to procure the said oxide in its natural state, he prefers to obtain it directly from the ores he has named by heating them in the manner herein described.

PROVISIONAL PROTECTION

HAS BEEN GRANTED FOR THE UNDERMENTIONED PATENTS.

1022.—WILLIAM DUFF and JOHN GILCHRIST, of Liverpool, engineers, for "*Improvements in apparatus for measuring water and other fluids, also capable of being used as a motive power.*" May 7, 1858.

1138.—WILLIAM CLARK, of 53, Chancery Lane, London, engineer and patent agent, for "*Improvements in the processes of treatment of peat and of the hydro-carburets it contains, and in the apparatus for the same.*" May 21, 1858.

1245.—ROBERT OWEN, of the city of Manchester, gentleman, for "*Improvements in water-closets, night commodes, or similar conveniences, and also in disinfecting processes.*" June 3, 1858.

1248.—THOMAS SCHOLEFIELD, of Paris, gas-meter manufacturer, for "*Improvements in gas-meters.*" June 3, 1858.

1251.—JOHN MITCHELL, of Dunning's Alley, Bishopsgate Street Without, London, assayer, for "*Improvements in purifying paraffine.*" June 3, 1858.

1267.—HENRY CARTER, of the city of Manchester, gas engineer, for "*Improvements in gas-burners.*" June 7, 1858.

1309.—JOHN ROBERTS, of Upnor, in the co. of Kent, terra-cotta manufacturer, for "*An improved construction of reflector or cover for gas-burners.*" June 9, 1858.

1328.—GEORGE BARTHOLOMEW, of Linlithgow, N.B., edge-tool manufacturer, for "*Improvements in that description of gas-meter commonly called wet meters.*" June 11, 1858.

1344.—GEORGE NEALL, of Northampton, gas engineer, for "*Improvements in gas-stoves for warming, cooking, and other purposes; as also in the saucepans, kettles, or other utensils to be used with the same.*" June 14, 1858.

1413.—JAMES ROBERTSON, of Glasgow, N.B., machinist, for "*Improvements in apparatus for regulating the flow or passage of fluids.*" June 22, 1858.

Parliamentary Intelligence.

MR. GOLDSWORTHY GURNEY'S PLAN FOR THE PURIFICATION OF THE THAMES.

(*Continued from page 379.*)

MONDAY, JUNE 21.

Mr. *Gurney* was recalled, and examined by the CHAIRMAN.

He was understood to say that since the last meeting of the committee he had been up and down the river almost every day, his object being not to discover the stench, but to ascertain what caused it more or less. He found that the stench came from the discoloured water, which was rendered so by sulphuretted hydrogen, and that no smell came from the water when they got beyond the influence of this gas. He found that the sulphurous smell was given out in large quantities whenever the water began to be black, and by following it down the river he had discovered that it died out between Blackwall and Woolwich, where it became a sort of muddy, clayey water, having a urinous smell with it. Up the river he found that the black water died out about Putney; the green and the yellow there commenced, and the difference in the colour was characteristic. The black water moved up and down with the tide in a state of agitation, but there was a sufficient quantity of it deposited on the sides of the river to produce a nuisance. In the middle of the river the water was comparatively clear, and at low water a difference of smell could be distinguished on the banks and in the centre of the stream; but when the tide was running with considerable force at springs, the matters in the water were completely mixed together. The deposit in the centre was not more than one in three; on the sides the whole was deposited at all times of the tide, because when the tide was going down the eddies were up, and *vice versâ*. The black colour was due to the organic matter, turned black by sulphuretted hydrogen. Wherever that quality of sewerage existed in large quantities, it was of a black colour.

In reply to Mr. ROUPELL, witness said the existence of the black water on the sides, and not in the centre of the river, was partly owing to the vicinity of the sewers, and partly to the natural tendency of a river to be clearer in the centre than at the sides. He had not made any chemical experiments recently, as he saw no reason to doubt the correctness of the data arrived at by those of last year. He might state to the committee that, in order to abate the horrid state of nuisance existing on the previous Friday, he had made use of lime; but the immense mass of stinking matter existing in the Thames was such that it could not be got under with a comparatively small quantity of lime. There was as much as 50,000 cubic feet precipitated by the experiment he referred to.

By Mr. TITE: The black matter was in mechanical suspension, and was deposited in the state of mud on the shore. That which was chemically suspended in the water formed a portion of it. The black water in the centre existed near the bottom, and there the current was so slow that it deposited. At low water the agitation of the river reached the bottom; the sewerage was then stirred up and carried away with the water. The lime was first thrown from four barges, two on each side—one at 50 yards from the shore, and the other double that distance at low water, between Blackfriars Bridge and the Houses of Parliament. When this was done, it was thrown upon the mud banks. He had no doubt it did good to some extent, but he did not apprehend any permanent result from it. The lime employed was "quick-lime," which had been slacked over night, and was as nearly as possible in the state which was called "cream."

By Mr. AKROYD: The sulphuretted hydrogen was generated by fermentation. The effect of using the quick-lime was to take up the organic matter, and form an insoluble substance. In the purification of gas it was usual formerly to pass it through lime, but the peroxide of iron was now used. That took up the sulphur. The cream of lime facilitated the precipitation of organic matter; to what extent he could not say, but perhaps half a scruple might precipitate pretty nearly a foot. By its use the deposit ceased to give out offensive smells, and to that extent the river was purified. If it could be applied directly to the contents of the sewers, it would be got rid of more quickly, but under ordinary circumstances this could not be done. In case of emergency it was possible, but if his plan were adopted it would not be necessary.

By Mr. CAYLEY: When the tide was at rest on the surface the current was not continued below; it began at the lower level before it stirred at the top. There was a period when it flowed at the top and not at the bottom, but that did not last long. There was a period of stillness in the whole mass, when the deposit fell in every part of the river; but that which fell perpendicularly in the middle was carried away by the action of the tide as it got near the bottom. That day the stench was so bad about the Houses of Parliament that the chairman of a committee of the Lords had sent for him to say that unless something could be done they would be obliged to adjourn, and he had been obliged to have recourse to chloride of lime and zinc. He attributed the increase in the stench to the river alone, and not to the factories on the other side, which were only offensive when the wind blew one way. There was also a nuisance arising from the gas companies emptying blue billy into the river more than was necessary. The smell now experienced in that room was almost entirely sulphuretted hydrogen.

Mr. TITE said the smell in the room appeared to him to be like that produced from an escape of gas.

Mr. *Gurney* said a small escape of gas did produce a smell like a water-closet; but that which was now experienced was entirely due to the river.

By Mr. CAYLEY: The solid sewerage did not float, but was brought up by the disturbance of the water. The spring tides brought up a large quantity, and that was the reason why the river was more offensive just at that time than, perhaps, it would be again. In his report he had given the specific gravity of sewerage after maceration, which took place very quickly in passing down the sewers. The sulphuretted hydrogen was produced by the decomposition of the solid parts, which was begun in the sewers and continued in the Thames. He considered the proposition to carry the sewers down to low-water mark as a very important one, and he believed it would so reduce the decomposition, that it would not become a nuisance. At present the sewerage in that state was thrown upon the banks, and exposed to the influence of the atmosphere.

Mr. Alderman CUBITT said he, as a member of the Metropolitan Board of Works, had got a resolution carried with that object, and it was about to be executed.

In reply to questions by Mr. LOCKE, the witness said he was favourable to the plan for carrying the sewers to the level of low water. At present the discharge took place only at low water, and the matter discharged was carried up the river. It found its way out to sea very slowly, in consequence of a large proportion being retained in the slacks and eddies; but if it were discharged into the bed of the river, it would run down for seven hours, and be only brought up for five hours, consequently would find its way out to sea much quicker. All the solid and fluid sewerage would certainly be carried to sea directly by the predominant outcast. He did not know the level at which the main sewers fell into the river. All above the level of high water were constantly discharging, but all below were more or less tide-locked. The Victoria sewer was three feet above low water. The Bridge Street sewer was trapped down to low water. All sewers above the level of high water might be made to discharge into the river at high water, and all below he would pump to a common level sewer during the time they were tide-locked. It would not be a very formidable operation.

By Sir JOHN SHELLEY: He was not before aware that the Board of Works proposed to carry all the sewers into the centre of the river. If carried out, that would be a great benefit, though perhaps not afford a complete remedy. The more the sewers were covered the better.

By the CHAIRMAN: To have the sewers carried into the Thames under low-water mark was his plan. He thought if that were done, the drains were closed, and the banks of the river made uniform with a slope of one in twelve, there would be no deposit and no effluvium. It did not come into his scheme to use lime for purifying at the ends of the sewers.

By Mr. ROUPELL: His scheme might be described as a system by which the Thames could be made to cleanse itself. It would not take any considerable time to enable it to perform that function. If the channels were cut, and the banks formed, the river would cleanse itself in a week. The deposits would not again accumulate—the object now was to get rid of that which had been accumulating for years. There was no question in his mind that the predominant outcast of the tide would carry the whole away with the first springs. If the action of the water did not reach a depth of three or four feet the mud banks would remain, and the river would soon fill up. The down-current operated upon the surface of the water at high tide, but as the tide ran down it affected a lower level. He did not think that if the plan were adopted they would suffer from an accumulation of mud below London Bridge.

By Mr. TITE: He did not think that mud under the permanent low water existed in any large quantities; there was none above London Bridge.

By Mr. AKROYD: The sewerage already in solution would still be poured into the Thames. It was a commercial question whether that could be made valuable as a manure, and upon that he would not touch; but, as a sanitary question, he did not think, under the conditions which he contemplated, it would be offensive. Sulphuretted hydrogen would then be generated very slowly, as the solid portion of the fœces and the soluble sewerage would go to sea—it would not stay long enough to generate a sufficient quantity to be perceived. If some plan could be devised by which to get rid of it, and restore the water to the Thames, it would be desirable.

By Mr. CAYLEY: He thought if the gravel were deposited upon the mud it would get rid of it, but in some instances it might be better to dredge. A channel had been dredged between that House and Vauxhall, and it had been given in evidence that the mud surface was as unchanged as the gravel. Part of his plan related to the burning of the gases, and there was no reason why that part should not be at once proceeded with. There was a greater deposit of mud now on the river banks than there was some years back, although perhaps it had shifted a little. He did not believe, as a general sanitary question, that any plan could be considered complete which did not relieve the town of the subterranean saturation of the sewerage which went on for so many hours daily; but, so far as the river was concerned, the removal of the mud would cure the evil. There was nothing could be done to remedy the other but having an outfall for the sewerage into some receptacle at all times of the tide. He saw no means of removing or getting rid of the gases and offensive æriform matters in the sewers themselves, except that of destroying them by combustion, or by applying some chemical mixture in the sewers, which would do it before they reached the Thames. He believed that the burning of them as air was the most simple, inexpensive, and successful mode.

By Sir JOHN SHELLEY: He had analyzed the mud in the Thames—the increased quantity of which was due to sewerage and earthy matters formed of the *débris* from the streets of London. There was a large quantity of iron and mica slate in it. The macadamizing of the streets might account for part of it, and the sewerage matter had of course very much increased with the increase of population.

By Alderman CUBITT: During the last ten or twelve years there had been a great increase in the number of steamboats, the action of which had a great tendency to wash down the banks of the river into the Pool. The substance thus mingled with the water was brought up by the tides. He did not think, however, that this was the cause of the deposits in this locality,

By Mr. TITE: The foreshore below the Pool was not dirty at the angles.

Witness, in conclusion, said that since his last appearance before the committee Sir John McNeil had called upon him, examined his plan, and expressed himself as clearly of opinion that, if carried out as suggested, it would succeed.

James Walker, Esq., examined by the CHAIRMAN.

I am a civil engineer, and have been consulting engineer to the Navigation Committee of the Thames for the last thirty years. I have seen Mr. Gurney's report, and am aware that he proposes to raise the banks of the river to an angle of 1 in 12. If he dredges the river, and obtains gravel to make his slopes with, I think they will stand against the action of the tide and the steamboats. There is no reason why it should not do so, even at a greater angle, if it would be more convenient for the barges. In the year 1840, I reported to the navigation committee in favour of some such scheme, and recommended the embankment of the Thames as Mr. Gurney has suggested. I think that the channels, once dredged, would maintain themselves, because, giving them a uniform width, there is no reason why accumulation should take place. I think, in order to accommodate trade, a wharf wall would be required in some places. That would be an expensive addition, but it would be to the interests of the parties whose property is affected to have it done.

The CHAIRMAN: Do you think the angle you speak of would be injurious to the wharfage?

Witness: One in twelve is what is called a sharp angle, and I think it would be better if flatter, and there is no reason why it should not be. The accumulation of mud upon the banks would not take place, as the steamboats would effectually cleanse the banks when the recesses are removed. I have not seen Mr. Gurney's rough estimate of the cost of dredging; the expense as regards gravel would be very small, because the material is useful for ballast and for building purposes. In this case, it would be required for backing the recesses. It would not be necessary to remove all the mud, but a portion of it should be taken away. If the gravel can be laid upon it, I would not remove the mud at all.

The CHAIRMAN: We want your opinion as to Mr. Gurney's theory, and as to whether or not, by gravelling each side to a certain angle, it would be likely to stand.

Witness: I do not think it would in all cases without a footing. On the concave banks of the river, it would require it in all cases. [Section handed to witness.] I do not think these channels would exist for a permanency, because the current of the river is strongest in the middle. I think a great deal of good would be done by getting rid of the mud upon the banks, but this is not exactly the way I should do it. I should make the middle of the river the deepest. I do not think it is necessary to Mr. Gurney's plan to have two channels.

By Mr. ROUPELL: I would have a line of piles driven close together nearly at the level of low water, and suit my slope from that to the present wharf wall at an angle of 1 in 12, or 1 in 6, or any other convenient angle; the footing should be kept up by this close paling, and all between the lines should be the navigable part of the river. In my opinion, the slope of 1 in 12 would not stand without a toe being inserted; the water would abrase the edge, and gradually undermine the slope. Paving it would partly prevent it, but the expense would be enormous, and the extreme edge would still be left unprotected. Occasional dredging would keep the channels open, but that would involve a serious annual expense. I do not see exactly the object of these two channels. I think that by deepening the centre of the river the duty which Mr. Gurney has assigned to his two channels would be performed, and the greater velocity—the current being in the middle—would keep it clear.

The CHAIRMAN: I think you do not understand Mr. Gurney's plan. He says we must have a certain depth there, so as to be able to discharge the sewers under low-water mark at low water.

Witness: Some years since I carried the largest sewer in London—the Fleet—below low-water mark. I do not consider Mr. Gurney's channels essential to lowering the outfalls of the sewers below low-water mark. I think if they were not made, but if the centre of the river was dredged and deepened, the outfalls of the sewers might be extended below low-water mark. And I might add that the river, when contracted and regulated, would deepen itself. Since the removal of London Bridge the river has deepened very much indeed.

Mr. ROUPELL: You are aware that Mr. Gurney's idea is to enable the Thames to cleanse itself, and you think that that might be done by a simpler system—that is, by one channel instead of two?

Witness: Yes.

Mr. *Gurney* was recalled to explain to witness some of the features of his plan.

Mr. *Walker's* examination continued: I have stated that, in my opinion, Mr. Gurney's channels would fill up on the concave side of the river. I do not think that would be the case with a channel in the centre. I do not think, if the banks were made as suggested, there would be any deposit of mud upon them. The deepest place in the river should be where the greatest velocity is, and, if you make a channel where that does not exist, it will tend to fill up. I am aware that Mr. Gurney's channels will be 6 feet deep and 30 yards wide. I do not say that such channels would speedily fill up, but I think they would not be permanent, and that dredging would be required to

keep them clear. I have given great attention to the eddies and retrogrades in the bed of the river, and I reported upon them in 1840. I do not think the proposed channels would counteract them. I think they would be remedied most effectually by a dwarf wall or embankment in the general line of the river. You must regulate, and improve, and make uniform the great stream of the river; but, taking Mr. Gurney's plan, and making a bank of 1 in 12 from the shore, you would leave the same irregularities that there are now. There is nothing in Mr. Gurney's report which would interfere with an embankment of the river. I doubt very much whether the channels would have the effect of giving the flow of the river a more equable course. It is very well to show it on paper, but I say practically that it is a delusion to attempt to make channels in the river.

Mr. TITE: You are not asked to give any suggestions of your own primarily. A scheme is referred to this committee, by which it is proposed to have all the banks of the river sloped to an angle of 1 in 12, beginning at 8 feet below Trinity high-water mark, at the wharf wall; having them all gravelled, and, at the toe of them, these two channels dredged. The sewers are to be all closely trapped, the gases generated in them burned, and the sewers themselves brought down below low-water mark, so as to discharge their contents into these channels. Do you think that scheme a feasible one, and, if carried out, would it answer the purpose?

Witness: I do not think it would, from the present wharf walls.

Mr. TITE: Be good enough to tell the committee why you think that, either in whole or in part, it would not be practical or permanently useful.

Witness: The first reason is this, that it would leave the irregularities in the width of the river just the same as they are now, and in those very wide parts mud would be deposited on the top of the gravel, just as at present. I say the river must be made uniform in width before you apply Mr. Gurney's slopes. If you do that, it will do good.

Mr. TITE: What is your objection to the channels which are to be dredged, and which are an essential part of the scheme, because the sewerage is to be carried in iron cassoons down into these channels?

Witness: I think they would fill up, and not remain.

Mr. TITE: It has been suggested and strongly urged that holes dredged in the river have remained permanently open. In your own experience, do you know anything one way or the other?

Witness: Yes, in ballasting. I am engineer to the Trinity House, and I know that when the ballasting barges work holes in the river it is a long time before they fill up. But my objection here is, that if you go to a place where there is a great width of mud now—say 100 yards—and begin against the wharf wall to make a slope of 1 in 12 for a width of fifty yards, and then make these deep channels in front of it, they would be in some cases entirely out of the river. I mean that fifty yards' slope and a channel of thirty yards' dredging would not be half-way across the mud, and there would be no current in it.

Mr. *Gurney* was recalled, and said the plan which he suggested would not be so.

Mr. *Walker*, re-examined by Mr. TITE: If the mud outside of these channels was dredged away, I think it would be brought back again to its natural position. I am perfectly sure—knowing, as I do, the evils which now exist—that unless some general improvement of the river is effected they cannot be got rid of.

Mr. CUBITT: Mr. Gurney's line against the wharf wall would be eight feet below Trinity high water—that is, the top of his slope. If he carried out his slope fifty yards, to form 1 in 12, by the time he got fifty yards out he would be somewhere about twelve or thirteen feet lower, and that would be below low-water mark?

Witness: Yes, six feet below.

Mr. CUBITT: From that edge he proposes to dredge out two channels thirty yards wide, with a fall commencing at 1 in 8, or something of that kind. What is to prevent a good current of water always running along that channel?

Witness: If the channel be in the line of the river, and the current not impeded in going into it in the straight line, there is nothing to prevent the water going in the way the honourable member has described; but my answer is, that you must remedy the river first, or it would not work.

By Mr. AKROYD: The river is now irregular in width, and I think the two channels would be injurious to navigation.

By Mr. LOCKE: The dwarf wall which I suggest is for the preservation of the uniformity of the river, and for the convenience of the wharfingers. It would be placed a little above low-water mark. I think a slope of one in twelve would sustain itself from any action of the tides. The idea of dwarf piling is as old as 1840. I do not think this plan will be perfect, either as regards the navigation or as regards the interest of the wharfingers, without it. In front of Calvert's brewery there is such piling; the tide flows over it, and the barges lie upon it. What I suggest is rather a modification of Mr. Gurney's plan. To make it successful, the irregularities must be done away with to the extent recommended in my plan of 1841. In all the alterations which take place in the City those modifications are attended to. I think the river would deepen itself, and do all that is necessary to carry off the sewerage matter as well or better without the side channels than with them. I think they would be of no use at all if the river is left as it now is; and I think, in the event of my own line being carried out on each side, the current would be so increased in the middle of the river that it would not be required. I do not recollect what the inclination would be from low-water mark up to the line laid down by me on this map. For the convenience of parties, it must be regulated a good deal by the distance of their present wharf and my river line. I think it might be left to the wish of the parties whose property it is. The inclination, of course, would vary according to the distance from my embankment to the channel of the river.

Lord PALMERSTON: What is the evil produced by retrogrades and eddies with reference to the deposit of offensive mud upon the shore laid bare at low water?

Witness: The eddy is the means of carrying the mud away, but much of it is left in bays, and, in place of going down, it settles and deposits.

Lord PALMERSTON: I understand you to say or to imply that the only way to prevent eddies and retrogrades is to make the channel of the river of equal breadth during the whole of its course?

Witness: Uniform, but even perfect uniformity we cannot maintain.

Lord PALMERSTON: You mean that the line of each bank should be a uniform curve; but it is not necessary that the width of the river should be equal in every point?

Witness: Of course the ratio of the river should increase downwards, as there is then more water to pass through it.

Lord PALMERSTON: But in order to accomplish the purpose of preventing eddies and retrogrades, must not the embankment, or dwarf wall, which is to confine the water inside, be placed so as to be at the low-water mark; because if you have any portion of the shore left dry within the confined banks you will still have a deposit of mud left by the receding tide?

Witness: No, not in all cases. Your lordship's proposition is correct generally, but in the river Thames, in consequence of the action of the steamboats, we have very little mud lying on the banks, except where the river is very wide; and, therefore, those deposits which are left in the front of the regular line the action of the steamboats would clear entirely. It is to the interest of the wharfingers to keep their wharves clear.

Lord PALMERSTON: Do you find sewers, the mouths of which are carried under the level of high-water, discharge all the 24 hours? I mean, supposing a sewer is carried to about high-water mark it will discharge constantly, but if the mouth of the sewer is below low-water mark it will always have a column of water over it; and I presume that that column of water will balance the column in the sewer up to a certain height of its inclination, and it is only when the column in the sewer is heavier than the column over the mouth of it that there will be a discharge; and, therefore, at high-water the refuse in the sewer, the mouth of which is below low-water mark, will be dammed up to a considerable distance into the interior?

Witness: Yes—depending upon the level of the sewer.

Lord PALMERSTON: What is the height between high and low water?

Witness: Eighteen feet.

Lord PALMERSTON: What longitudinal distance would you give a sewer to reach a height of 18 feet above this mark, according to the usual construction of sewers?

Witness: Eighteen feet in a mile would be a very rapid fall. I am making the greatest sewer in this country, and I make the bottom a dead level, without a rise at all, for 30 miles.

Lord PALMERSTON: Therefore, if all the sewers of London were brought to discharge into the middle of the river, or under low-water mark, they would be dammed up for a very considerable distance during the greater period of the day?

Witness: That is the case now, and always will be. It produces a great nuisance in London, and though great pains have been taken to prevent it, by gratings in the streets and otherwise, it is one of those things that are unavoidable; and if you take the sewers down to the mouth of the Thames the same thing will occur there.

Lord PALMERSTON: The sewers during that time would be longitudinal cesspools, as they are called, with all the inconveniences arising from them. Supposing, on the other hand, there was a perpetual discharge of the filth of London into the river, do you conceive that that would get rid of the nuisance of bad smells arising from that refuse?

Witness: I do not think it would; because, if you carry it into the river, you still leave the same level of water as in the sewer. Supposing the whole of the refuse of London were discharged into the middle of the bed of the Thames, there is no doubt the mixture of all that fœtid matter would produce a very pernicious effluvium in the houses and places on its banks as it is doing now.

Lord PALMERSTON: Therefore, any plan which goes upon the principle of discharging the sewerage of London into the bed of the river within the district of the metropolis would not be a remedy for the evils arising from the disengagement of pernicious gases during the decomposition of the matters so discharged?

Witness: I quite agree with your lordship that it would not be a complete remedy. The first thing we have to do in order to lessen the evil is to improve the river, and whatever sewers are made, unless that is done, would still leave it in an offensive state. I am, therefore, an advocate for equalizing the sectional area of the river first. It might then be necessary to carry out the expensive system of sewers proposed, executing the upper parts first, because they will discharge by gravitation.

Lord PALMERSTON: The inference to be drawn from what you have stated is, that no plan would secure London from the bad air produced from the refuse of the sewers which did not carry that refuse down to a much lower part of the river than any point within the metropolitan district, and, therefore, any great expense incurred in carrying out the plan which Mr. Gurney has suggested would still leave the sewers as the great evil from which arises the impurity of the Thames?

Witness: Yes. Mr. Gurney's plan, with my modifications, would diminish the evil.

Lord PALMERSTON: How would it diminish it if the whole of the refuse is to remain suspended in the river, floating up and down?

Witness: Because we should get rid of the recesses and eddies and all mud upon the banks. All the gentlemen who have reported upon the subject consider that the mud upon the banks in a putrid state is the great source of the evil, and that would be all got rid of by embanking the river.

Lord PALMERSTON: But supposing it should be proved that the most offensive smells proceed from the high tides more than from the shores left bare at low water, your cure would not be effectual. Are you aware that recently the most offensive smells have come from the river at high water?

Witness: I think it is not at all unlikely, because the flowing back of the tide brings the offensive matter up the stream, and at this season of the year the quantity of fresh water going down is very small. I found this morning that the column of river-water which goes down is not equal to more than a quarter of a mile in length of a section of the river.

Lord PALMERSTON: What is proposed to be accomplished by Mr. Gurney's plan and your modification is to wash from the slope of the shore into the stream at all times the whole of the refuse of London. Would not the only difference be that the river at low water would then be more strongly impregnated with the refuse than it is now, and that at high tide it would be the same thing whether the water contained all the matter by having washed it up from the shore laid bare, or whether it received it at low water?

Witness: That is assuming the water in the sewers to be as prejudicial to health as the water depositing mud upon the banks of the river. Now, chemists have all agreed that the greatest evil arises from the matter contained in the mud upon the banks, which you will get rid of by Mr. Gurney's plan and mine. I do not think the matter washed into the river at low tide, and brought up by the flood, would be as noxious in its emanations as the effluvium arising from the putrid mud laid upon the banks. It is only a question of degree, however; for I do not think any plan would entirely purify the Thames.

Lord PALMERSTON: Except having tunnels to intercept the sewerage, and carrying it down to a lower part of the river and depositing it there.

Witness: I have thought a great deal of that, and I assure you, practically, I do not think it possible. It will be found very difficult to do it. Take, for instance, a simple fact in the construction. You will come by-and-bye to the dock entrances, which are some 10 feet below low water.

Lord PALMERSTON: You can go to the back of the docks. You are not obliged to follow the bend of the river.

Witness: Speaking practically, it is not easy to be done. The first thing necessary is to equalize the river, and if that is not sufficient, to make the high-level sewers.

Lord PALMERSTON: The result is, that your plan and Mr. Gurney's would equally discharge all the sewerage into the river within the metropolis, to be got rid of as it might, by the flow and ebb of the tide?

Witness: Yes.

The committee then adjourned, it being understood that they were about to proceed to a personal inspection of the river.

MONDAY, JUNE 28.

Mr. *Walker* was recalled, and examined by Sir JOHN SHELLEY.

Having looked at the sections I do not think that the proposed channels would be permanent, and I think they would be injurious to the navigation of the river. I do not perceive what the object of them is, and I think the better course would be to deepen the bed of the river, and thus increase the velocity of the general current. I would narrow the river where it is now too wide, and thus give uniformity to its boundaries. I think the slopes should commence, not from the present wharf walls, but from the amended line; they would then stand with the dwarf piling which I have suggested, and which I consider the interests of trade would require. My opinion is, that if, instead of two side channels, a centre channel were cut, the water would take that course naturally. Whether the lime which has recently been thrown into the river will have a good effect, temporarily, is a difficult question to decide, and is better left in Mr. Gurney's hands.

By Lord JOHN MANNERS: If an embankment were carried along the Middlesex side, and not the Surrey side of the river, it would do good so far, but it would be only doing it half way. I have stated for the last twenty years that I think the embankment is very desirable; and I believe there would then be no mud in the river at all.

By Mr. ROUPELL: If Mr. Gurney had proposed first of all to regulate the width of the river, and had still adopted his peculiar side channels, I think his plan would have answered. I do not see much difference between his general proposition and mine, except that he would place his slope outside the general line of wharves, whereas I carried them inside, in the recesses. The details are very different, but to understand them it would be necessary for the committee to look at my plan. Generally speaking, the river would not require so much dredging in the centre as at the sides. The depth to which Mr. Gurney proposes to dredge his channels would not at all affect the outlet below the bridges, nor affect the natural fall of the river. I have not much considered the question of the effect of embanking one side of the river, because I believe the right way is to do both; but I do not think the first would be very injurious, though the tendency would be to throw the strength of the current on the other side, but it would be close on the side where I should make it uniform. Both banks of the river are about the same level—just high enough to prevent the tide from overflowing. I think the embankment on the north side would not injure the wharfage on the south—nor, indeed, in any way practically.

By Mr. TITE: I thought I understood Mr. Gurney's plan thoroughly from having read his report, but since I was here I have seen him, and he says I do not. If the apprehension I have of his plan be correct, I think it would be a fallacy; that is my deliberate opinion. I do not think that, if the embankment scheme were carried out partially, and a series of docks created, there would be any inconvenience arising from them. I think the advantage they would offer to trade would more than counterbalance any disadvantage arising from their construction—indeed, I do not think it possible that a great trade could be carried on by barges without having docks open or closed. No doubt mud would accumulate, owing to there being no current in them, but you must make provision for trade.

By Mr. LOCKE: I do not think it is desirable that all sewers should discharge, as Mr. Gurney proposes, at or about low water. For the purpose of getting rid of the sewerage it is much better that the sewers should discharge at high water. It is fair, however, to say that at the present time, when so little land water is coming down, it is of no very great consequence. If there were a larger quantity, and the discharge took place at high water, the sewerage would be carried three or four miles down, and would not come up again. I do not think the embankment would have the effect of making the river as pure as necessary, nor that it would obviate the necessity for making intercepting sewers, but it would get rid of a great amount of the evil, and, after it was done, there would be no deposit in the Thames.

By Mr. CUBITT: My embankment would diminish the capacity of water in the Thames at certain parts. I am aware that in Mr. Gurney's plan the foot of the slopes would be below low water, still I think there would be a necessity for the piles wherever the current ran close to them; but the piling is intended more for the advantage of trade than the protection of the slopes.

By Mr. AKROYD: It is fair to Mr. Gurney to say that he intends in the great recesses or bays to bring the top of his slope to a regular line, which I conceive is a great improvement upon the plan as I previously understood it. The channels on each side would not afford facility for vessels to moor, as there would be only six feet of water in them at low tide, and heavy vessels would not lie in them if they could avoid it. Admitting, for argument's sake, that he succeeded in making his channels and keeping them clear, the tendency undoubtedly would be to scour the banks on both sides.

By Mr. PERCY: There would, however, be this disadvantage, that instead of one deep channel in the river you would have three. It was part of my plan originally to do as Mr. Gurney suggests, viz., that all the retrogrades and brattice cesspools be destroyed; that all obstructions to a uniform flow of the river at low water be removed; that the projections along shore be rounded off, and the hollows filled up; that the serrated edges of the river at low water be made plain, and continued along the whole line of low-water mark; that the width of the water-way, when the tide is at its lowest ebb, be not more than 140 yards from side to side, so that the river may run, not only in a uniform current, but at a rate of not less than 225 feet per minute; and that from low-water mark upwards the beach be so constructed that the shore may rise at about an angle of 3° to 4° with the horizon, or, in road-making language, of not less than 1 in 16, to facilitate the fall of the sewerage into the bed of the river.

After a few more inquiries on the same points by Lord Goderich and Mr. Percy the examination of the witness terminated.

Lewis Thompson, Esq., recalled, and examined by the CHAIRMAN.

Since I was last here I have examined the condition of the Thames very carefully, and the views which I have before expressed in reference to Mr. Gurney's plan have not been thereby affected.

The CHAIRMAN: When you were here before you expressed the opinion that a great part of the mischief arose from the deposits in the brattices and cesspools, and that if you could make a sloping bank, could burn the gases in the sewers, and send the sewerage under low water, nine-tenths of the effluvium now arising would be destroyed. Every one is now complaining that it is not exactly at low water, but almost at high tide that we have this horrible effluvium in this neighbourhood. Can you account for this upon your own theory?

Witness: Undoubtedly. I think the mud deposits here at high water, as the water recedes it is left on the banks, but when the water returns it necessarily disturbs the mud. The mud being of a dark colour, as soon as it is exposed to the sun, becomes heated, and when at 65° or 70° a putrefactive process sets in. But as the mud is of a very viscid nature, the gases are retained until the water comes up again to disturb it, when the gases are liberated—and consequently you have the stench. If, therefore, you could remove the mud, as Mr. Gurney has proposed, into the centre of the river, the down current, when it set in strongly, would sweep it all into the sea.

The CHAIRMAN: Then it does not arise from the sewerage matter which is brought up, but from the water when it disengages the gases?

Witness: Yes; I have stated that there is no appreciable amount of impurity in the water itself; that is to say, if taken from the centre of the river and filtered, you might drink it. It is really in the mud which evolves the gases when the tide disturbs it.

The CHAIRMAN: Then the tide in these brattices and cesspools leaves a deposit, which, exposed to the action of the heat, generates gases to be liberated into the atmosphere by the next tide?

Witness: Yes; you have fermentation going on now during the day which in cold weather does not take place.

By Lord PALMERSTON: A sewer which delivers its refuse into the Thames smells very offensively at all times, but especially in the summer. This arises from the putrefactive fermentation of the animal matters which are suspended in the sewerage waters. If the contents of all the sewers in London were discharged into the Thames, the waters of that stream would approximate to the condition of a sewer, which, in warm weather, would emit most injurious and offensive gases.

Lord PALMERSTON: Therefore the effluvium from the river would not be confined simply to the disengagement of the gases from the mud left dry at low water, and afterwards disturbed by the flood tide; but even if the banks of the river were so constructed that no mud could lodge upon them, and the refuse was discharged into mid-stream, the waters altogether would emit the same noxious effluvium.

Witness: It would be considerably less so, because the water itself does not, in fact, heat by the action of the sun to the same extent as the dark mud on the bank. It seldom reaches that temperature in which putrefaction takes place, but the mud does so very speedily under the action of the sun. The water has constantly a motion in it, but the mud has none; and if the mud lies for five or six hours exposed to the rays of the sun, it passes into that state of putrefaction which I have referred to. In other words, the temperature of the water is almost always considerably lower than that of the banks.

Lord PALMERSTON: But the water in the river is more exposed to the sun than the water in a sewer, which is covered over, and therefore I suppose the temperature is higher?

Witness: The water in sewers is of considerable temperature: not only is there constantly a large quantity of warm water going into them from factories, &c., but the process of fermentation is going on; and there being a large amount of animal matter in them they become very much heated. I think the temperature of the river is seldom so great, in consequence of the evaporation from the surface of the Thames, which cools it. If, therefore, all the sewerage of London were swept into the stream it would not be so dangerous to life, although necessarily it would be very offensive—to the imagination, at least—unless it were allowed to remain long enough to become fermented. No doubt the mud and filth of London, held in suspension in the river, would ferment to some extent, and gases would be evolved from the offensive matters in hot weather, but it would not be to the same extent as at present. If the sewerage of London were carried down by tunnels to a very low point of the Thames—one where the salt and fresh waters meet—a great part of the contents would gradually become absorbed by the sea, but a portion would return. The soluble portions would go entirely, but some of those which are held in mechanical suspension in the water would return.

Mr. TITE: You have suggested that the mud, which is a deposit from the sewerage waters, is the cause of the offensive smell whenever it is stirred up by the water. You are not, perhaps, aware that the other day we found the greatest smell where there was the most water?

Witness: I presume the water had been higher and was then flowing down completely charged with the offensive matters from the mud banks. I find very little mud under low-water level. I have ascertained that by experiments made under the river. The greatest accumulation on the banks is from Westminster Bridge downwards to below Hungerford. No doubt it has been going on for the last twenty-five years, and estimating that the deposit in the slacks was so little as 10 per cent. of the solid portions discharged by the sewers, there would now be 200,000 tons and upwards. There are very offensive gases evolved from the sewers, especially in those portions which run slower than others, because accumulations there take place, and fermentation goes on; but it is of a very different character to that arising from the mud, and totally different to that which is now in this House. There are a great many processes by which sewers could be deodorized so as to become harmless as regards disease and smells. It might be done at the mouths of the sewers themselves, or at any time before the contents get into the river. It has been suggested to put lime into the sewers high up. That would naturally flow down, and would tend to neutralize any odours arising from them, because matters which have been mixed with lime will remain for a considerable time without undergoing the putrefactive process.

Mr. TITE: Then do you think that if lime were introduced into the sewers mechanically in the present season, and kept there till something more permanent could be done, it would diminish the evil to any extent?

Witness: It would only prevent the sewerage which comes down now from undergoing fermentation; it would not at all affect the large bulk already in the river. But again that is a question of degree, and you might no doubt produce a considerable effect.

By Mr. CUBITT: In the present state of science with regard to deodorizing, I do not think it possible to establish separate deodorizing works at the outlet of the sewers in such a manner as to be perfectly innocuous and inoffensive in the neighbourhood. I am afraid it would create a nuisance, under all circumstances, to the immediate locality.

By Mr. AKROYD: That portion of the plan which relates to the burning of the gases might be brought into operation in six months. Supposing cream of lime were poured into the sewers, it would have the double effect of deodorizing them and of precipitating the sewerage, and that would be of advantage in meeting the present evils arising from the sewers. The lime acts as an antiseptic on the animal matters. I had an opportunity of witnessing some experiments, a few days ago, in which the sewerage was precipitated, and the smell in the immediate neighbourhood destroyed. All the surplus lime from the sewers would have a remedial effect upon the waters of the Thames. I do not think that its use would produce a disagreeable appearance in the river; it would make it rather white, which would be better than its present filthy muddy aspect. If it were possible to establish deodorizing works at the outlets of the sewers which would be

no nuisance to the locality, and to combine with that some simple filtering apparatus, and then remove the deposits from the banks, there would be an end of the question. The soluble matters would readily go to sea, and they would be inoffensive, because they would have been purified by the lime.

By Mr. CAYLEY: In order to prevent the sewerage matter finding its way back to the metropolis, the intercepting sewer must have no connexion with the river, but go at once to the sea-shore. If you empty it into the river at all, there is no point at which that objection could be removed. The higher the temperature is above 65° the more rapidly does decomposition go on; at 90° it is exceedingly active. In the hottest weather the river is seldom above 72°; but the mud, from the effect of the sun, is not unfrequently 120°. Persons on the steamboats tell me that the river is much worse this year than last; but it is difficult to say whether or not the accumulations of mud are increasing. I have certainly not heard that they are less.

By Mr. PERCY: I attribute the black cloud which Mr. Gurney says goes up and down the river not entirely to the mud banks, but to the water being surcharged with light mud. Some portion of the fœtid odours are attributable to the liquid sewerage, but that is chiefly of an ammoniacal character. There is ammonia in the mud; that is to say, there is a quantity of animal matter in the mud which is capable of generating about 1 per cent. of ammonia. I have not detected any urinary matter, except a portion of uric acid. There will always be some portion remaining in the water; but if you sweep the banks I am satisfied you would get rid of 99 per cent. of it. The sewers would still require to be ventilated, and the gases to be burned.

By Lord GODERICH: The insoluble portions of the sewerage are those which return up the river. The very floculent portions may be traced on the surface of the sea for many miles from the mouth of the river. I think the matters held in solution in the water are of very little consequence, and under any circumstances they will still be there; that is to say, if you deodorize the sewerage the soluble portions would remain in the river, and there are no means of getting rid of them. I do not consider, however, that they would be a serious injury to the public health. If it could be shown that the mud banks had not increased of late, I should attribute the increased smell from the river to a change in the composition of those banks.

By Sir JOHN SHELLEY: If the mouths of the intercepting sewers were sufficiently near to the sea, everything would be carried away with the outfall of the tide, and but very little would return. I know but little on the subject of the boundaries of the river, but I should imagine that the cultivation of the land high up the stream has tended to lessen the quantity of water flowing into it. I am not aware that any deposit of sewerage matter has taken place near its mouth. I think that lengthening the present sewers so as to make them discharge below low water, will not effect any alteration in the existing state of things; it will merely diminish the gases. At present the sewers are receptacles for foul gases, which, as the tide rises in them, are driven backwards into the houses. The proposal has been made to connect the sewers with the rain-water pipes on the sides of the houses; but I conceive nothing could be more dangerous to the health of the inhabitants. There is an engineering difficulty in the way of constructing the intercepting sewers so as to discharge at the mouth of the river when the tide is receding, and that is, the storing of the sewerage. I am aware that it is proposed to have a chamber to receive the sewerage while the tide is running in, but I think that is a most objectionable thing; it would be a focus of mischief. Putrefaction would be constantly going on in the new sewerage from the leaven of the old which remained. It would be absolutely necessary to have a shaft close to such chamber for carrying off the foul gases; but that would not prevent the sewerage going out in a fermented state; and I think vessels entering the mouth of the river would decidedly object to it, as it would float on the surface of the water. The fluid portion of the sewerage undoubtedly contains the principal agricultural value. That arises almost entirely from the presence of a substance which we call urea, and which resolves itself into carbonate of ammonia. It contains half its weight of nitrogen, which plants require a supply of. Deodorized water, if kept for a while in a bottle, will become stinking, and if turned into the docks it would be very objectionable; but if discharged into the river, the mass of water is so large that it would be so diluted as to become harmless.

By Lord J. MANNERS: I have recently examined a sample of water taken in the London Docks in my presence from the upper part, which appeared to be in a very filthy condition. I have not analyzed it for want of time. It contained when taken a small quantity of sulphuretted hydrogen, of which there was a distinct odour, and a piece of paper placed in it was discoloured. Comparing the water in the docks with the river, I should say the former was much the purest. There was no animal matter in suspension in it, but bubbles of gas came to the surface from the mud at the bottom.

By Sir J. SHELLEY: There is no danger of explosion from the burning of sewerage gases; they are so much diluted with atmospheric air that there is no risk. The experiment has been tried in the metropolis. It was done in a very confined state at a soap-boiler's in the Blackfriars Road. There was no steam passed into it—it was merely what is called dry combustion. By the aid of the steam-jet the risk would be very much diminished.

By Mr. ROUPELL: The putrefaction of sewerage goes on more rapidly when the temperature of the water is high. The temperature of the sea is always lower than that of the river. If the sewerage were conveyed to the coast in iron tubes, and there mixed with sea-water, it would decompose with diminished rapidity, not only on account of the lowness of the temperature of the sea, which is generally below the putrefaction point, but on account of the large quantity of saline matter in the water. The very contrary result would take place if only conveyed to a part of the river where the water was merely brackish, because a small quantity of salt has a tendency to promote decomposition. I am not practically acquainted with the fact, but I think it likely that when the tide in the river overflows the marshes, there is a considerable deposit. The natural tendency of a river is to raise its banks by its overflows, and the marshes on either side have undoubtedly been raised principally from the overflow of the tide and the precipitation of alluvial matters. I think we have at the present moment a portion of sewerage going down the river and finding its way out to sea, a considerable portion deposited on the sides by the overflow of the tide, and a large portion brought back to London by the flood-tide. I am not practically acquainted with the fact, but I can readily believe that the sewers for many miles on each side of the river are in a most filthy state; and, during the dry season, the sewerage matter will deposit on the sides of the sewers where the fall is slow, in the same way as is done in the river, and if the present system of flushing were discontinued, the consequences would be most pernicious, because the gases generated there would find their way up the gully-holes and into the houses. I think that in any system of sewerage as little as possible should be left to manual labour; it should act as much as possible by itself. No doubt by chemical means the sewerage may be rendered comparatively innocuous, but it is difficult to say how far any plan would be successful, as so much depends upon the care with which it is carried out. I think, if you have a system of purification for the sewers, it would be better to separate the sewerage from the storm-waters; you would thus make the former more marketable. The reason it is not so now is, that the storm-waters passing through the present channels of the sewers bring with them a large amount of metallic substances from the streets, composed of iron from the horses' shoes, wheels, &c. This is in the form of protoxide of iron, which is very poisonous to plants. The great dilution from the spring and autumn rains, to a large extent deodorizes the sewers. I have been making experiments to ascertain the chemical means to deodorize the mud, and I think there is nothing better than by the chloride of potash to get rid of the smell. I have no doubt the disturbance caused by the traffic of the steamboats liberates the gases in the mud.

By Lord PALMERSTON: The process of deodorizing the sewerage is by mixing some earthy matter with the liquid, which precipitates the soluble portions. Some persons employ a metallic base. In operating with lime, if you mix 20 grains of slacked lime with a gallon of sewerage, you will obtain a precipitate. [Exhibited a specimen of sewerage water thus dealt with.] Upon examination of this matter, we find that it yields 1 per cent. of sulphate of ammonia and a half per cent. of phosphoric acid; consequently, as manure, it is better than ordinary farm-yard dung. If, when dried and made up into a marketable shape, it could be disposed of within five or six miles, it would have a commercial value; but if it had to be transported further, the cost of cartage would be more than its worth. Therefore I cannot look upon it, in a commercial point of view, as of any value; but it becomes a question whether, for sanitary reasons, it should not be adopted. There is a considerable difference between the matter taken out of a sewer and out of a cesspool. In the sewer water you have a vast variety of matters which never find their way into cesspools. In point of fact, in the one case the material is almost valueless, whereas in the other it would be highly valuable. The occupation of nightmen under the old system of cesspools, though an offensive business, was not injurious to health, as the decomposition going on in them generated carbonate of ammonia; but in a river like the Thames at the present time it is difficult to say what it is—certainly not carbonate of ammonia. The gases which are generated are various forms of hydrogen; you have carburetted hydrogen, sulphuretted hydrogen, and probably certain other organic compounds which chemists have not yet recognized. In truth, the odours which we have given off by the mud are substances which, in chemistry, at present we have no knowledge of. At Leicester and Rugby there is very little of the *débris* of the streets in the sewers. I have examined the matter from Leicester, and find a very small quantity—scarcely 1 per cent. of iron in it. I have not examined the works there.

By Mr. LOCKE: I have no idea of the quantity of excremental matter discharged by any single sewer into the Thames, but I should think the total quantity is about 260 tons per day.

Mr. LOCKE: Do you think that 260 tons would be a large undertaking to deodorize and transport to some place to be formed at the mouth of the sewer—divided into the number of sewers there are?

Witness: I think the difficulty lies in the enormous quantity of water with which it is diluted, and which I am told amounts to 15,000,000 cubic feet. I think you would need two reservoirs, each capable of holding 20,000,000 cubic feet in the aggregate.

Sir J. SHELLEY: With regard to the question of the value of deodorized sewerage, I understood you to compare it to farm-yard manure. Am I right in supposing that if you could get out the protoxide of iron, which every one knows is detrimental to the growth of plants, the one would be applicable to such vegetable products as turnips and mangel wurzel, and the other to corn?

Witness: You have more phosphoric acid in sewerage matter, and therefore it would be better for turnips than farm-yard manure. The silicate of potash in the latter forms the great ingredient in the straw, and is therefore more applicable to the growth of corn.

The CHAIRMAN: You are in favour of some temporary measure for disinfecting the sewerage. Supposing that were done, have you any idea what proportion of the evil would be corrected by taking the gases from the mud and sewerage?

Witness: I apprehend that for a long period you would not experience the slightest difference in the sewerage of London. In fact, if you do not remove the mud at once, you are just where you were.

Mr. ROUPELL: You laid great stress upon the existence of iron in the mud; are you aware that the iron from the streets did not find its way into the sewers formerly?

Witness: I was not aware of the fact. I find it now in the mud to a very large extent.

By Mr. AKROYD: By deodorizing you would prevent the smells from the drains, as far as the houses are concerned, and do away with those noxious effluvia from the gully-holes which now almost knock you down.

By Mr. CUBITT: The quantity of feculent matter, which I estimate at 260 tons a day, is largely augmented by the filth from the streets. It would require one-fourth, or some sixty tons of lime, to deodorize that matter.

The CHAIRMAN: You were asked to make an analysis of the atmosphere of the Houses of Parliament and of the river. Have you done so?

Witness: I have; and I now present the result in a tabulated form. I may say that I have been largely assisted in doing so by Mr. Gurney and Mr. Maugham. I have taken the atmosphere at almost every part of the building and at other places—viz., Hyde Park and Kennington Common. The result shows a great diminution in the quality of the air; so much so, indeed, that I may state the air in some portions of this House is hardly respirable, nor is it good in others. One broad circumstance appears to be developed by these experiments, and that is, that the air, after passing the mist-jet, is invariably enriched in the amount of its oxygen, which is the vitalizing principle of air—the portion which supports life and combustion. I have examined the air before it reached and after it has passed the jet, and I find a very great increase of oxygen at the latter period. I find that water itself absorbs, not atmospheric air, but oxygen and nitrogen in equal proportions, and that we have in water 33 or 34 per cent. of oxygen, whereas in the atmosphere we have only 21 or 22 per cent.; consequently, when the atmospheric air entering this House is made to pass the small disc jet of water, it mingles with the oxygen liberated by the pulverizing of the water, and passes into the House surcharged with it; that is to say, it contains a much larger quantity than it would otherwise do. In addition to that, it happens that water has the power to combine with the carbonic acid of the air, so that the air passing into the House through the spray jet is not only enriched in oxygen, but is deprived of its carbonic acid. Another circumstance which I have noticed in connexion with this inquiry is that the air taken at the top of the building—that is, from the Victoria and Clock Towers—is considerably vitiated in consequence of their happening to be built up to that point to which the products of combustion reach before they begin to fall. It will be remembered, perhaps, that when here before

I said that they would be better places to take air from than below. I said so, not being aware of this circumstance, but arguing from the general fact that the higher you go the purer the air is. In this case it appears to be an exception to the rule. The air there contains much less oxygen, much more smoke, much more carbonic acid, but no sulphuretted hydrogen. No doubt there is a large quantity of the sulphate of ammonia in the atmosphere of London generally, and this appears to me to be acting upon the surface of the stones of this House. By the action of the rain this is carried into the texture of the stone, and decomposes the magnesia of which it is composed, converting it into sulphate of magnesia or Epsom salts. From stones in this locality I have extracted a considerable portion of Epsom salts by merely putting them into water, which is afterwards evaporated. I tried the atmosphere here at almost all hours of the day, but particularly during the periods when the House was sitting, and I find as the result that the air is generally very good as it enters, and that it becomes more and more vitiated in different parts from the carbonic acid exhaled from the lungs of the members present. [Witness handed in paper containing results of his experiments.] A pure healthy atmosphere consists of 21 per cent. of oxygen and 79 per cent. of nitrogen. Any deviation from these proportions shows the measure and extent of its impurity. [Witness read portions of the paper just referred to, from which it appeared that in the Star Chamber and Court only was the atmosphere found to consist of these exact proportions.] The air, after passing the spray jet, had a slight excess of oxygen, and in all the other places where experiments had been made there was a deficiency varying from ½ to nearly 2¾ per cent., the greatest impurity being in the vaults and on the terrace, in the Speaker's small dining-room, the peers' library, the Lord Chamberlain's and Lord Chancellor's rooms, the committee-rooms of the House of Commons, and Mr. Burton's and Mr. Gurney's rooms. The atmosphere of the river contained only 17 2-10ths of oxygen, showing impurity to the extent of 3 8-10ths per cent., and the top of the Victoria Tower 19½ per cent., showing impurity to the extent of 1½ per cent. During the period of making these experiments the effluvium from the river was very bad, and he smelt it when upon the Victoria and Clock Towers.

The CHAIRMAN: At what point does the loss of oxygen become dangerous?

Witness: I think when air contains less than 16 per cent. of oxygen it would be dangerous to breathe, because it would necessitate, instead of taking sixteen respirations, that you should take twenty-one to get the same amount of oxygen, and that would speedily fatigue and exhaust the system.

The CHAIRMAN: In the present state of the House of Commons, do you think the loss is a dangerous one?

Witness: I think that any person with an affection of the lungs or disease of the heart would not be warranted in staying in an atmosphere such as I have found it. As a medical man I should not recommend it.

The CHAIRMAN: With regard to the Speaker's house, I see there is one room in which there was only 18 per cent. of oxygen?

Witness: That is one where men were painting at the time, and therefore the deficiency may be accounted for. I think the situation of the Speaker's house is most objectionable from certain causes. Test-papers which I affixed to the walls were considerably blackened near to it. The disturbance of the mud by the steamboats landing passengers close to it, and the existence of the mouth of the sewer there, make it very bad.

By Mr. ROUPELL: The effect of the jet which dissipates the water into drops is to produce additional oxygen in the air, in the same way that a shower of rain produces a purifying effect in the atmosphere. I think a jet of water in the form of a fountain would tend to purify the contaminated air of these rooms. It not only evolves oxygen, but absorbs the carbonic acid given off by the lungs, and which, to a considerable extent, exhausts the air.

By Lord PALMERSTON: The air in Hyde Park, although better than on the terraces of the House, was still below the standard of purity; the cause of which may be attributable to the locality generally.

By Mr. TITE: There is a sensible difference between the air in the House of Commons and on the Victoria Tower in favour of the former, which I attribute to the spray jet. It is very remarkable—I never saw anything of the kind before. I am told there is no ozone in the atmosphere at the present time. The fact is, that any quantity of organic matter floating in the air would destroy it. We have not sufficient knowledge of the subject to be able to determine whether that produces an inclination to disease, but we find when epidemics prevail there is a deficiency of ozone in the atmosphere. No doubt the surplus hydrogen does affect the air for breathing, not that it is poisonous in itself, but because of its taking the place of the oxygen, which is useful. It dilutes the air, and mars its vital quality. Sulphuretted hydrogen is positively injurious.

By Mr. AKROYD: The water from the spray jet is not decomposed. The air, which is chemically combined in it, is given out by its being split with the disc. Chloride of lime destroys sulphuretted hydrogen, and a solution of it might be employed in the spray jet; but the objection to it is, that it generates sulphate of ammonia, which to many persons is very objectionable. Mr. Gurney has, I believe, contrived a medicated jet; so that if at any time the carbonic acid should be in excess in the air he could mingle chloride of lime and purify it.

By Mr. TITE: The specific gravity of sulphuretted hydrogen is sufficient to prevent its rapid diffusion.

By Mr. PERCY: By pyrogallic acid, which is the most complete mode of analyzing the air, Berthollet was unable to detect any foulness even in the atmosphere of the plague hospital at Jaffa. When the moisture in the air is condensed it is done by means of ice. I have a portion condensed on the Victoria Tower. By evaporating it you get a small portion of sulphate of ammonia. I was anxious to know this, because it was thought that the products from the furnace might affect the Clock. I do not think there is any reason for supposing so.

By Sir J. SHELLEY: I very much doubt whether these stinks which we now experience are caused by these gases at all. I believe they arise from one of those forms of hydrocarbons which have a very singular power of communicating smell without existing in any great quantity. I should think the quantity of ammonia passing up the chimneys of the metropolis is very considerable. Formerly all our ammonia was obtained from soot—hence the fertilizing power of soot. The quantity of sulphate of ammonia which is now destroying the air is enormous, and is beyond anything which we can guess at. I believe we may generally put down the ordinary Newcastle coal as yielding 2 per cent. of ammonia; and if you remember that 3,000,000 tons are annually consumed in this metropolis, you may form some idea of the immense amount. If you could secure all the ammonia which passes up the chimneys you would have something more valuable than the deodorized produce of all the sewers put together. In fact, you find at gas-works, that with them this is a very important product. It is called ammoniacal liquor, and consists of ammonia and sulphate.

By Mr. AKROYD: We have it on evidence that chloride of lime is a most powerful disinfectant, and to those who do not object to the smell of chloride it is the best and cheapest.

By Mr. PERCY: The spray jet may absorb a little of the sulphuretted hydrogen, but it cannot wholly prevent it getting into the House.

WEDNESDAY, JUNE 30.

The committee reassembled this day, and recalled Mr. *Gurney*, who said that before giving his evidence he hoped the public press would deal fairly, and give the evidence in favour of his plan as well as that against it.

The room was hereupon cleared, and the committee remained for some time in consultation. Upon the public being admitted,

The CHAIRMAN said the committee could not prevent the publication of the evidence, and passed a resolution regretting that some parts of the evidence which were in favour of Mr. Gurney's plan on a former occasion had not been given, as well as that of Mr. Walker against it.

Mr. *Gurney* was then further examined by the CHAIRMAN.

He adverted to the lodging of the sewerage in brattices near the shore, and said that when the committee went down the river the other day in a steamboat, nearly opposite Rotherhithe Church, in the centre of the river, the water was tested, and it was found to be altogether free from smell, while on the sides of the river the water was not much better than that in an ordinary cesspool. He had taken water from the London Docks, and that taken at fifteen feet from the surface was found to be perfectly clear. He had at first been deceived by its black appearance, but on further examination he found it arose from the colour of the bottom. The smell principally arose from the water at the sides of the river. The sewerage from the sewer emptying itself into the river near Hungerford Market was quite clear, occasioned, he believed, by deep pits in it, in which the sewerage was precipitated. He was not aware whether there had been any diversion of the sewerage from that sewer. A slope of the banks of 1 in 16 would generally keep them clear, but 1 in 12 would be much better. [The witness then gave some further evidence, which was entirely of a technical and scientific character.]

George P. Bidder, Esq., examined by the CHAIRMAN.

I am a civil engineer, and have been so for many years. I have read Mr. Goldsworthy Gurney's report, but it is a considerable time ago, and I do not exactly understand upon what part of it I am called upon to give an opinion.

The CHAIRMAN: Well, first of all, part of Mr. Gurney's plan is this—He intends to form two channels, thirty yards wide and three yards deep, with an average distance of fifty yards from the wharf walls, with a slope of 1 in 12, by which means he considers that the mud which is now cast upon the banks of the river will be removed, and so get rid of the nuisance. Do you think, if he succeeds in dredging channels of 30 yards wide and nine feet in depth, which are supposed to receive a scouring power, that these channels will keep themselves clear without any material expenses in dredging?

Witness: I cannot tell whether the expenses would be material or not, but they will require dredging, as the bed of the river is composed of gravel, and that is moved by the current of the river. When the old London Bridge was removed, a great change took place, for both Blackfriars and Westminster Bridges were affected by it, and recently Vauxhall-Bridge piers had to be encased with stone-work. I cannot speak to the necessity of deepening the present channel of the river, but it is impossible that these small channels can be kept clear without artificial assistance. If they can be kept clear without having recourse to dredging, I should say that it would be almost miraculous. Clay will resist any amount of scour, but gravel will not. The formation of these two channels would be very inconvenient as regards the navigation of the river, and especially at low water, if steamers got aground on the edges of these channels. If they were formed they might stand. I think the question as to whether these slopes would retain the mud at the inclination proposed must greatly depend upon the locality, as the mud remains on a slope at Blackwall with an inclination of 1 in 5. Taking the upper part of the Thames generally, I do not think that a slope of 1 in 12 will prevent the deposit of mud. If all the outlets of the sewers were taken down to low-water mark it would be beneficial to a certain extent, and the noxious gases would be arrested, but no other advantage would arise from it. I agree with Mr. Bazalgette—indeed, I have no doubt of it—that the sewerage lodging on the mud banks is the cause of great evil. Mr. Hawksley has assisted me in examining the river for the Metropolitan Board of Works; we are still pursuing our inquiries, and I hope in a few days to be able to give you all the information you require upon this subject.

Mr. ROUPELL: You say that the gravel in the river is liberated by the current or stream of the river; is not the motion a slow motion, and, if it is so, would not the gravel be carried down the river?

Witness: Yes; but below London Bridge I find mud on the banks and gravel in the middle of the river. But, as regards the slow motion of the gravel, you may have a notion that it is slow; but I do not think, if it moves 100 yards in a day, that can be called a slow motion. If there are to be angles from the shore of 1 in 12, I do not believe that they will be free from mud. I cannot say, as a general principle, that a slope of 1 in 12 will be sufficient to prevent mud from depositing on them. If the sewers of the metropolis were to be carried to low-water mark in the river, the probability of the sewerage being carried to the sea would be the same as it is at present. It would be the same in that respect, but it would prevent the accumulation of mud on the banks.

Mr. TITE: Supposing all the sewers to be trapped, the sewerage to be turned out of the sewers at low-water mark, the noxious gases to be drawn out of the sewers and burnt in furnaces with high chimneys, and that there should be an angle on the shore, with a slope throughout of 1 in 12, with channels on each side of the river to facilitate the drainage to the sea, do you think that this plan would be a solution of the drainage question? Give us your opinion upon the whole scheme, as a remedy for the present evils.

Witness: That would open the whole question as to whether these two little channels will cure the impurity of the Thames. That is a question I would rather go into at another time.

Mr. TITE: I want your opinion now. Do you think the whole scheme a feasible one?

Witness: I do not think it is a feasible plan at all. I would not recommend adopting any part of the scheme.

By Mr. Alderman CUBITT: It would of course be an advantage to keep the banks of the river clean. There is a great difference between the slopes on the banks of the Seine and the Thames, as one is a tidal river and the other is not. I have no doubt that these channels would fill up.

By Sir B. HALL: Looking at the map on the wall, it indicates that the current of the river towards the Penitentiary is to the north, it then sets to the south towards Lambeth Palace, and then it is diverted to the north approaching Waterloo Bridge; but we are told that, if this deep channel is

formed, instead of the natural current it will be diverted to the south side at Waterloo Bridge, do you agree with that proposition?

Witness: Certainly not.

Sir B. HALL: Will not the result be this—the fresh water that comes down will strike the south side of the river below Lambeth Palace, will then be turned in a northerly direction near Waterloo Bridge, and there fill up the channel rather than deepen it?

Witness: I have no doubt of it. To suppose that these two little channels will alter the course of the river is quite out of the question. I do not think it would be desirable to prosecute this scheme as to these channels; and, in point of fact, if they were made it would be so much money thrown away.

By Mr. PERCY: I have no scheme of my own, nor have I given an opinion upon any other scheme. If these channels were made and were silted, the expense of dredging them would depend entirely upon the time they took to fill up. If they required dredging once a month, of course the expense would be very great; but I will undertake to say they will fill up. I do not believe a general slope of 1 in 12 will answer, and I have alluded to Blackwall, where the mud accumulates on a slope of 1 in 5. I am not aware that great damage has been done to harbours and other places by embankment of rivers.

By Lord PALMERSTON: Gravel has a constant tendency to travel towards the centre of the river. So long as there is an impelling force, and it continues equal, and it meets with no obstruction, gravel continues its onward course; but that depends upon the size of the gravel.

Lord PALMERSTON: Suppose the bed of the river to be perfectly uniform and smooth over all its area, and the force equal, then the action of the current would have no effect?

Witness: None at all. The removal of London Bridge had led to the deepening of the channel above bridge. If these channels were made they would fill up, and could not be maintained. They would silt up more or less. I will give you an instance of that. I lately made holes in some grounds of mine through which a stream runs, for the purpose of holding fish, and they have all filled up with gravel. To make a running channel uniform in all its parts, that man must be more than mortal. It might be in the constitutional tendency of Nature to make deep places, but that could not be done by any other course. I do not believe that if you cut off an elbow in a stream formed by Nature that you can do so without forming another. If all the sewers were to discharge their contents at low-water mark it would prevent exhalations, and would be so far beneficial, but it would not relieve the river.

By Sir J. SHELLEY: As far as getting rid of the mud banks this scheme would be beneficial—there is no doubt of it. I do not think that would cause any silting up of the channel, as the sewerage matter is so light. With regard to the edges of these channels at low water, they would have a bad effect upon the navigation. The stability of these channels would depend a great deal upon the materials which were put in. Bricks would not remain unless they were cemented together. Granite blocks would stand, but that would be a great additional expense.

By Lord J. MANNERS: A dredged channel will fill up. I am not aware of any part of the river which has been dredged having filled up.

The CHAIRMAN: Are you aware that a channel has been dredged, at a cost of £10 for the use of the steamboats, between the Houses of Parliament and the landing-stage at Westminster Bridge, and that it has not filled up?

Witness: At the cost of how much?

The CHAIRMAN: At a cost of £10.

Witness: I don't believe a word of it. (A laugh.)

By the CHAIRMAN: I approve of slopes, if made of a sufficient incline; but I do not think that the mud could be washed off with an incline of 1 in 12. I also approve the plan of sending the contents of the sewers by means of closed channels into the river at low-water mark, for the same reason as I approve of removing mud from the banks. The cutting of a channel on each side of the river has never been heard of before, and will never be heard of again. Any rational man would carry a channel to the centre, and not on each side of the river. This plan, in some respects, seems to me to create an evil for the purpose of overcoming it.

By Mr. ROUPELL: Some portions of Mr. Gurney's plan might to a certain extent be useful, but the work ought to be carried out in a more extensive manner. I have made no special examination of the river after reading Mr. Gurney's report.

By Mr. TITE: The river is as irregular longitudinally as it is crosswise. If it were suggested that these channels should be formed, that the mouths of the sewers at low-water mark should be trapped, and that the gases should be burnt by connecting the sewers with a furnace, I should certainly not feel disposed to recommend the adoption of such a course as a temporary expedient. If an intercepting sewer were formed, except for the removal of the mud banks, these works would be of no use whatever.

By Mr. Alderman CUBITT: The deepening of the channel would not necessarily affect the safety of the bridges.

John Bennett Lawes, Esq., examined by the CHAIRMAN.

I have given great attention to the sewerage question. Some portions of Mr. Gurney's plan have come under my notice. I read the report some time ago. My opinion is, that the deposits on the mud banks of the Thames are the great cause of the nuisance. I agree with Mr. Gurney that, to whatever distance you carry the sewerage down the river, it will come back again. I agree with Mr. Gurney, too, that a great deal of the present nuisance arises from the mud banks of the Thames. If Mr. Gurney's plan would get rid of the mud banks and a great deal of the sewerage which is floating about the river, it would be a great improvement; but I cannot say that his process would do that. Mr. Gurney's plan would prevent the deposit of mud on the banks, and would prevent the exhalation of gases as far as low-water mark; but, as he sends all the sewerage into the Thames, I do not think it will meet all the difficulty. As long as we have a mass of floating sewerage in the Thames, Mr. Gurney's plan will not remove it. In warm weather there is a great escape of the noxious gases.

The CHAIRMAN: If the sewerage were discharged at Barking Creek, do you think that it would return to London?

Witness: I think a considerable part of it would return.

The CHAIRMAN: Would it return in such a form as to be injurious to the inhabitants of London?

Witness: I think it would. If sewerage deodorization works were to be established at Barking Creek I do not think any value would be found in the manure.

By Sir B. HALL: I am not able to say from actual experiments what part of the sewerage will return to the metropolis. I have made no experiments of that kind.

Sir B. HALL: Can you give any idea of the effect of the lime which is now thrown on to the mud banks?

Witness: It will arrest the nuisance to a certain extent; but I think it will have a prejudicial effect on the navigation of the river, as for every ton of lime thrown in you get four tons of deposit; and if you throw in 100 tons a week, that may prove a very serious matter. All the sedimentary matter goes down to the bottom by the action of the lime, and if the practice of throwing lime into the river went on long enough, the navigation would be choked up.

Sir B. HALL: Suppose a large quantity of lime to be thrown into a sewer where the current was slow, what would be the result?

Witness: It would choke up the sewer. There is no doubt that the lime would cause a large amount of deposit.

By Lord PALMERSTON: Supposing all the sewerage of the metropolis to be discharged into the stream of the river, and retained there for some little time before it was carried down the river, and there was a certain amount of temperature, it would emit noxious and disagreeable gases?

Witness: The river would be dangerous when the temperature was from 68° to 70°. The temperature of the atmosphere would then be about 120°. There would always be a great deal of noxious exhalation during summer. To secure London from the inconvenience to which it is now subject, and to remove the sewerage to the lower part of the river, and to prevent it coming back within the limits of the metropolis, they must destroy that part of the sewerage which is held in suspension, as the matters held in suspension are the most dangerous.

By Sir J. SHELLEY: I think the smell from the Thames would be removed if they threw in lime enough; but that would be at an enormous expense to the ratepayers. I do not think that the spending of £1500 a week in lime would have the effect of raising its price in the market. The present nuisance may probably last as long as the warm weather lasts.

At half-past four o'clock the committee adjourned.

(To be continued.)

METROPOLITAN GAS SUPPLY.

(*Continued from page* 384.)

TUESDAY, JUNE 22.

The committee reassembled this day at twelve o'clock—Mr. MOWBRAY in the chair. All the members were present except Mr. Jackson.

Dr. *Challice* recalled, and examined by Mr. LOCKE.

On the last occasion I referred to a bill which was introduced into Parliament for legalizing the districting arrangements between the South London companies. I now produce that bill. I likewise produce a circular, addressed by the Phœnix Gas Company, and signed by their secretary, Mr. Pridden, on the 24th of December, 1853, to the consumers of gas in their district, on the occasion of the advance being made in the price of gas. This was before the "South London Gas Consumers' Mutual Protection Society" was formed. That society was not established until the application for the bill was made to Parliament. At the time the circular was sent round there had been no meeting upon the subject of the price of gas, but there was a general feeling of dissatisfaction, and complaints were made that the rise in price was one of the first fruits of the districting arrangements. [Witness read the circular, which stated that in consequence of the great increase in the price of coal, iron, freight, labour, &c., the directors were compelled to raise the charge for gas to 4s. 6d. per 1000; but that, upon the return of the price of the above-named items to the scale of 1852, the gas would be again sold at 4s. Witness then continued:] The price of coal did, as I firmly believe, return to what it was in 1852.

The CHAIRMAN: Do you know what the price of coal in the metropolis was in 1852? and have you taken pains to ascertain what it has been in the various years between that year and the present time?

Witness: I have inquired of the various large coal-owners and contractors, and they say they are equally as low as they ever were. I am not here to state it of my own knowledge.

Mr. RUSSELL: Pray will you tell me, when the Surrey Consumers' Company was formed, was there not a promise made that 5000 consumers would take gas from them?

Witness: I have heard so.

Mr. RUSSELL: Are you aware what number actually fulfilled their promise?

Witness: I am told there were complaints on the part of the Consumers' Company that the promises had been violated by the consumers; but the consumers contend that when the company started, their gas was of such inferior quality that there was a marked distinction between the supply to those who were attached to their mains and those on the old companies'; and this was one of the reasons given for persons not fulfilling their promises. I believe there was a violation of promise.

Mr. RUSSELL: I find it has been stated by Mr. Thwaites that not more than 1000 of the 5000 fulfilled their engagements—was that the case? And was it not in consequence of the neglect of the consumers in fulfilling the engagements they had entered into, that the Surrey Consumers' Company were obliged to take steps to enable them to carry on their operations, having been deserted by the parties on whose invitation they were first formed?

Witness: I believe at the time the company was formed, this state of things did exist. In the meantime, they got a large number of consumers, and this was their argument for breaking faith with the consumers at the period of the districting. I believe the directors of the Surrey Consumers' Company were supported by a large number of consumers. I cannot give distinct evidence as to that, but I know there were complaints at the commencement with those who were engaged to become consumers on the introduction of the new company. The old companies, too, reduced their price to the price proposed to be charged by the new; and many yielded to their special solicitations to remain with them, and thus avoid the usual inconvenience of having gas cut off and obtaining a fresh supply. But you must permit me to state that this was a charge brought against a large mass of consumers, and their answer was, that the gas company did not lay their mains where they had promised to do so at the commencement; that the gas was of a poor illuminating quality, and very frequently no light at all could be obtained. Those were the reasons given by the consumers who had pledged themselves by something like an agreement why they did not fulfil their engagement. I am not prepared to say that the parties would very naturally look for some excuse to justify their breaking the pledge they had given. I believe there were faults on both sides. Very strong solicitations were probably used to induce them to remain with the older companies, who had reduced their price, and thus taken away the inducement for change: it is human nature. In the first instance there was very great excitement, and it is possible that many persons were glad of an excuse, in order, as I said, to avoid the inconvenience which always attends the cutting off and laying on of gas, more especially as I believe the Phœnix and others of the old companies held

out great inducements to large consumers to continue with them upon contracts considerably lower than 4s. per 1000. It was thought that the Surrey Consumers' Company was formed for the benefit of the consumers at large in that portion of the metropolis; but the companies which supplied that part of London found it convenient to divide it into districts, and the Consumers' Company became willing parties in that arrangement.

By Mr. ADAMS: I cannot answer the question which was put to me before, whether the Surrey Consumers' Company have given up any portion of their district in consequence of this arrangement, or whether they still retain the lighting of the whole district which they are authorized to supply by their Act of Parliament. It is the impression that they made a good bargain.

Mr. ADAMS: But that they have not transferred or discontinued the supply to any portion of the district assigned to them by Act of Parliament?

Witness: O dear me! they have.

Mr. ADAMS: But I want to know the fact, in order to test the correctness of a return by them which I have before me, and in which they say that the company have not ceased to supply, and have not transferred any portion of the district within the limits of their Act.

Witness: My impression is that they were entitled to supply all Southwark by their Act.

Mr. ADAMS: According to the return I have before me, it states that by the 6th section of their Act they were entitled to supply the parishes of St. James, St. John, Horsleydown; St. Olave, Southwark; St. Mary Magdalene, Bermondsey; St. Mary, Rotherhithe; and St. Paul, Deptford, in the county of Surrey; and St. Paul and St. Nicholas, Deptford, in the county of Kent. Now, of your own knowledge, are you aware whether they have ever transferred any portion of that district to another company?

Witness: I am not aware that they have transferred any portion of that district. Probably in some other section there is power to supply all Southwark.

Mr. ADAMS: They say in this return that since the passing of their Act they have supplied every part of their district, except a small portion of the parish of St. Mary, Bermondsey; and that they have not discontinued to supply any portion of the district assigned to them.

Witness: My answer was, that one reason why those who had agreed to take gas of the Surrey Consumers' Company did not do so, was because they did not furnish mains where they had the power to do it, and therefore a portion of those 5000 consumers could not get the gas.

Mr. ADAMS: Are you aware that the portions of which you speak, and which you say they have not supplied, have been supplied by any other company?

Witness: Previously?

Mr. ADAMS: No; whether now or ever have been?

Witness: Portions, doubtless. The Phœnix Company have supplied portions which are now supplied by the Surrey Consumers' Company.

Mr. ADAMS: That is a transfer to the Surrey Consumers', but I am speaking of a transfer from them.

Witness: I do not know; but that they have transferred some territory which they had the right to supply, that I believe.

Mr. ADAMS: Can you name the district?

Witness: Christ Church, Blackfriars.

The CHAIRMAN: Do you state that of your own knowledge, or is it merely an impression?

Mr. ADAMS: Is not Christ Church included in the South Metropolitan district?

Witness: A part in the Phœnix and a part in the London.

Mr. ADAMS: I have a return before me which is made by the South Metroplitan Company, and they say Christ Church is in their district. Can you, referring to the question put to you before, describe any portion of the district, which is within the limits of the Act of the Surrey Consumers' Company, which they have transferred to some other company?

Witness: I am not aware. I cannot give evidence as to what they gave up, or whether they gave up any.

By Mr. BYNG: In Mr. Pridden's letter it says that the directors of the Phœnix Company wish it to be distinctly understood that the price of gas will be restored to 4s. per 1000 cubic feet when the price of coals, iron, and freight are reduced. That has never been done. In the letter which I produced here on the last occasion a reason is assigned by the directors for their not doing so. That was one of the grounds of our complaint.

Sir W. HAYTER: Are you aware whether the rise of price to 4s. 6d. in 1853 took place suddenly or not?

Witness: I am not aware that it did.

Sir W. HAYTER: Are you aware that three gentlemen, of the name of Bone, Wade, and Thwaites, were appointed as representatives of the consumers on that occasion, to confer with the gas companies?

Witness: I believe not. I should say, most decidedly not.

Sir W. HAYTER: You will be surprised, then, to hear that Mr. Thwaites took an active part on that occasion, and was a person who assented, under the circumstances stated, to the increased charge for gas?

Witness: I know that Mr. Thwaites and Mr. Bone were trustees under the Surrey Consumers' Act, and some dissatisfaction was felt in Southwark on the subject of the districting; but we were never acquainted, at least as far as my own knowledge goes, as to the consent of the trustees to a rise in the price of 12½ per cent., beyond what was distinctly stated in the bill of the Surrey Consumers' Company as the maximum.

Sir W. HAYTER: Were they limited to 4s. in their Act?

Witness: So I believe.

Sir W. HAYTER: Then how can they charge 4s. 6d.?

Witness: I don't know.

Sir W. HAYTER: Has it ever occurred to you to look at the Act, and see whether they have exceeded their powers?

Witness: I have never seen the Surrey Consumers' Act, but it was a matter of notoriety that the price was never to exceed 4s.

The CHAIRMAN: As chairman of this association, you come here to complain of the conduct of the Surrey Consumers' Company, and say you never looked into their Act?

Witness: I may have been guilty of some dereliction of duty in that respect. I have never looked into the Act on that point.

Sir W. HAYTER: But surely, if the fact is that the price is limited to 4s. in the Act, and they have been charging 4s. 6d., you have the remedy in your own hands?

Witness: Probably I am in error as to what is in the Act, but I know when it was applied for; it was a matter of notoriety that the price was not to exceed 4s.

Sir W. HAYTER: Then pardon me for saying you know nothing about the matter.

Witness: I think I may give evidence which will be serviceable to the committee.

Sir W. HAYTER: You do not know about the price, you do not know what is in the Act of Parliament, or whether you have the remedy in your own hands or not?

Witness: We have not, or we should not be here. I am not aware whether the three trustees, Messrs. Thwaites, Bone, and Wade, are mentioned in the Act. I saw their names, as trustees, in the company's documents. They were trustees for the consumers, to act for them. We never knew that when the price of gas was raised it was after a communication had by the gas companies with those gentlemen, and with their assent. There were great complaints by the consumers that the price was raised without any communication being made to them on the subject. I do not know whether it was made with the assent of the trustees—it was not done publicly. I shall not be surprised to hear that it was, after what has occurred since. We did not suppose that the company formed for the consumers would consent to such an arrangement without consulting the consumers at large. I have not heard directly that such an arrangement was made by the gentlemen who were appointed trustees. I heard it stated so, but I have not inquired into the truth of it.

Sir W. HAYTER: Surely it was such an important matter that you ought to have done so?

Witness: Mr. Thwaites and Mr. Bone too have attended public meetings on this question, and a bill was issued as a notice to the public, signed by those gentlemen, that the Bill (in Parliament) was withdrawn in consequence of the refusal of the companies to introduce protecting clauses for the benefit of the consumers. I have not got a copy of that bill with me. I believe it stated that those protecting clauses were something very similar to those we are now asking for.

Sir W. HAYTER: At any rate the price was raised in 1853 from 4s. to 4s. 6d. Since that time a rigid system of districting has been preserved, but, notwithstanding that, there has been no further rise in the price of gas?

Witness: Not a positive advance as regards the money charge per 1000 feet, but there has been an increased charge for gas, in consequence either of the quality or of the manner in which it has been supplied.

Sir JOHN SHELLEY wished to put further questions, but the Chairman considering it was somewhat out of order, the room was cleared.

On the doors being opened,

Dr. *Challice* was again called, and examined by Mr. LOCKE as to the district supplied by the Surrey Consumers' Company, as shown on the map, and as defined in the Act of Parliament. He then continued: The Surrey Consumers' Company was established at first without an Act, and when so established there was nothing to prevent their supplying the whole of Southwark. Afterwards, this Act, it appears, confined them to a certain district. There is a small portion of the parish of St. Mary, Bermondsey, which they are authorized to supply, but which they have given up to the South Metropolitan Company. I do not know whether they are limited by their Act of Parliament to a charge of 4s. 6d., and a dividend of 8 per cent. [Mr. Locke read the 23rd section of the Act, which fixes the maximum price at 6s. per 1000. Witness continued:] The principal reason why the consumers did not take gas from the company, as they had agreed, was, that the gas was extremely bad. Another reason was that the old company offered to supply them at 3s. Messrs. Thwaites and Bone were trustees for the consumers, but we never knew how they became so. It was an arrangement between the directors of the company and these gentlemen on their applying for their bill. I have never heard that there was any distinct authority given to them by the consumers of Southwark. I have never seen any one who could give me the information, and I have asked many persons. I am not aware of their having any distinct authority to act in that capacity. We were not aware of the course they adopted on this occasion, and only saw the results in the rise of the price of gas. Not even then were we aware that they were acting as trustees on the part of the gas consumers of Southwark. The first I heard of it was on the occasion of this association taking active measures; they attended the public meeting in that capacity. Mr. Thwaites made a speech on that occasion, in which he reproached the consumers for not keeping their promises; and there was some considerable agitation on the point, as he was reproached for having suffered the districting to take place. Mr. Thwaites did not then state that he had received any direct authority from the consumers of Southwark to act on their part. It was before he was the chairman of the Board of Works, and he exercised a great influence in the borough from his position and considerable talents. He was the chairman, I believe, of the St. Saviour's Board of Guardians or Trustees. The consumers generally repudiated his having been appointed trustee.

Mr. RUSSELL: Repudiated or repudiate?

Witness: They repudiate it now.

By Mr. LOCKE: The date of that public meeting was March, 1855. I believe that, previously to the establishment of the Surrey Consumers' Company, a company had been established in the City of London, at the instigation of Mr. Charles Pearson, called the Great Central Gas Company. Gas had been sold in the metropolis at 4s. per 1000, and I remember attending some of the meetings which were held about that time for the purpose of getting the price in Southwark reduced to the same rate as was charged in the City of London. I am aware that the price was brought down to 4s., for the first time in the City, in consequence of the agitation which took place with Mr. Pearson and the company which he established. The Surrey Consumers' Company was established after that in Southwark, and it was intended to apply to Deptford and Greenwich as well.

By the CHAIRMAN: I stated on the last occasion that the rise in price to 4s. 6d. was one of the first fruits of the districting. The price of coal, iron, and freight were dearer at that time, but I still adhere to the opinion that the advance in the price of gas was owing to the districting. I believe the reckless and determined competition, if I may use the term, which the companies had carried on against one another would have prevented their raising the price, and that they would have gone on until better times and supplied gas at a loss.

The CHAIRMAN: You think that, in consequence of the reckless competition, they would have supplied gas at a loss?

Witness: I think it very likely they would, knowing the extent to which competition existed between the companies.

The CHAIRMAN: Then is it a complaint you prefer to this committee, that the companies are not doing as they did previously to 1853—supply the people of Southwark with gas at a loss to themselves? And do you propose that the Legislature should by their action provide that, whatever may be the price of coal, iron, freight, and labour, the gas companies should supply their consumers, even at a loss to themselves, at a fixed price?

Witness: No: I do not think so. I think no opinion of mine could bear that construction.

The CHAIRMAN: With respect to the quality of the gas, you complain of that which is supplied by the Surrey Consumers' Company. Are you aware that by the 51st section of their Act there is a provision that the ga

supplied by them shall be of such an illuminating quality as to produce from an argand burner, having 15 holes and a 7-inch chimney, and consuming 5 cubic feet per hour, a light equal in intensity to the light produced by 12 wax candles burning 120 grains per hour? And are you aware that by the 52nd section there is a provision by which all trustees, vestries, commissioners, or public boards, have power to test the quality of the gas supplied?

Witness: I was not aware that this was in their Act.

The CHAIRMAN: Were any steps taken by any trustees, commissioners, vestries, or by this association, of which you are the head, to put this provision of the Act of Parliament in force before you came to Parliament for a new Act?

Witness: We complain that the gas had been tested at the works. I believe that the gas consumed is not more than 6-candle gas.

The CHAIRMAN: Has a chemist ever been appointed to test the quality?

Witness: I believe Mr. Warrington has been appointed by the trustees, Mr. Thwaites and Mr. Bone; but the public, as I stated just now, know nothing of this appointment, nor anything of the gas being tested, except that it has been tested at the works. There has been no certificate of the quality given. I was not aware that there was a penalty provided in the Act if the gas was not of the right illuminating power. No steps have been taken to enforce such penalty.

By Sir W. DUNBAR: I did not state that the maximum price of gas should be fixed at 4s. 6d. I said I should prefer that to 6s. I said I should desire to have a sliding-scale, because, as the gas companies make a rise in the price of gas in consequence of the rise in the price of materials, they should be required to reduce it when those materials are lower. There are great differences in the cost of freight, and I believe that difference is as much as 50 per cent. sometimes.

The CHAIRMAN: Has your imagination anything to do with this?

Witness: I acknowledge I was asked just now, and I must be excused if my answers are not quite so clear as they ought to be. I know, as a householder, the price of coal, and that it is as cheap as ever it was. I merely know the price of freight from what I read in the newspapers; and I am informed by many persons who have vessels that they can get but little sometimes for their coasting freights. I should imagine—I believe that it would fluctuate, if a sliding-scale were established, as much as 50 per cent.

The CHAIRMAN: Upon what kind of estimate would that sliding-scale be?

Witness: I believe that gas may be supplied with considerable profit at 4s. per 1000.

By Sir W. HAYTER: I said that I thought a sliding-scale might answer. If it were established, the price would vary, of course. I stated the other day my reasons for objecting to a maximum. I think, if the price of gas were determined by the price of coal, &c., it might probably, in the case of war or some other event not contemplated, be as high as 6s., which I imagine in such a case would not be an improper price. I never heard of a deed, signed by Messrs. Thwaites, Bone, and Wade, and a large body of consumers, by which those gentlemen were appointed trustees. The Surrey Consumers' Company was established to supply gas at 4s. per 1000 and to do away with the monopoly. I know from hearsay that the Phœnix was formerly a very profitable company. I do not know what their dividends were at the time the districting arrangements took effect. I know that their shares were at a discount, as a patient of mine went out of his mind upon the subject. I think it was somewhere about that period that the London Company ceased to pay dividends. They had previously paid 5 per cent. In consequence of this competition, I believe the South Metropolitan Company's shares were at a discount. I do not admit that at the time the rise in the price of gas to 4s. 6d. took place, the shares of the old companies which were supplying the district were at a discount, but very likely they were.

By Mr. RUSSELL: I stated that, Mr. Warrington's examination of the company's gas being confined to the works, the public had no faith in any report which he made. I was not aware of the fact stated in the paper before you, that the inspection of Mr. Warrington was not at the works, but at the mains, where the consumers are supplied. I believe the contrary. He is at liberty to report as often as he pleases; perhaps once a quarter I have seen his report published. I believe it was by the secretary of the Surrey Consumers' Company, in answer to a statement which I made in public, in order to show what the quality of the gas was. I do not know that he is bound to report once a week, and oftener if required; I think it was stated by Mr. Thwaites that he had the privilege of doing so at any time. I only know that the inspection takes place at the works from seeing that some of the certificates state, "tested at the works." Of course I do not know that Mr. Warrington has never tested the gas from the mains; it is not possible I should. Mr. Warrington is a man of eminence, and a highly competent man. He is the professor of chemistry at Apothecaries' Hall, a man of great respectability, and no doubt a man who would not put forth a report unless he had good grounds for believing what he said.

By Sir JOHN SHELLEY: With regard to Mr. Warrington, I say nothing against his capability as a chemist; but my firm impression is, that he tests the gas at the works, and not where it is delivered to the consumers; and, consequently, that he tests it where it is strongest, and the consumers have gas delivered to them which I believe to be of inferior quality. Mr. Warrington has no motive for protecting the consumers. He is not appointed by them, and is not paid by them; he goes where he is told to test the gas, and there is no protection against the company, in the course of the day, supplying gas of a different quality to that which he has tested. The sum and substance of my evidence is this—that whereas the price of gas is 4s. 6d., that, upon apparently the same quantity being consumed by the same number of burners, the payment by the public in money of late years has risen 60, 70, and 80 per cent. I believe that the mode of delivering the gas through the meters causes them to register more gas than actually passes through them. I have seen that fact illustrated since I was last here.

Sir JOHN SHELLEY: With reference to the dividends of the companies, you were examined on the first day upon this point, and you stated that the companies had paid out of revenue for many of the improvements they had carried out—do you still adhere to that statement?

Witness: I adhere to the opinion that larger dividends might have been paid by them. We have facts to prove that a vast alteration in the position of the companies has taken place since the districting.

By Mr. BARROW: One of my complaints is, that the gas supplied to the workhouse has been raised in respect to the amount paid. I instanced that as a place where there were good regulations. It is under the management of the Board of Guardians. I do not pretend to know whether any of the public authorities have appointed parties to test the quality of the gas.

Mr. BARROW: If you have the power already by Act of Parliament to test the gas, do you want any fresh powers from us to enable you to do what you have not already done?

Witness: I am not answerable for any neglect on the part of the Board of Guardians, if they have the power. There is a guardian here to whom the question may be put. As far as I know, they have not done it. We are not aware that the gentleman who has been appointed by the trustees has tested it anywhere else than at the works. The company may have afforded him every facility in testing it, but they have never sent him to the persons who have complained, and they have certainly had innumerable complaints.

Mr. BARROW: Could the Legislature give you any wider powers than are already given by this (the 52nd) clause for the purpose of testing?

Witness made no reply.

Mr. BARROW: The Surrey Consumers' Act is dated in 1854—your complaints arose in 1852 and 1853? At the time this Act was applied for, you had full power to come before the committee of the House of Commons to whom it was referred?

Witness: Yes, the public undoubtedly had.

Mr. BARROW: There are a great many clauses, I see, giving security to the consumers—one in reference to the accuracy of the meters. Has any application, to your knowledge, been made to the vestry to exercise the authority here given?

Witness: I believe there is an inspector of meters appointed, but it is perfectly useless. The complaints of the increased registration of the meters are very numerous.

Mr. BARROW: I want to know, if you have the power to appoint an inspector of meters and a person to examine the purity of the gas, what other provisions you can suggest or propose upon those points?

Witness: It is quite new to me that the consumers have power to appoint an inspector of meters.

The CHAIRMAN: Are you the chairman of the Gas Consumers' Protection Society, and is this information new to you?

Witness: It is.

The CHAIRMAN: And do you come before the committee to state that you have learned for the first time to-day what are the provisions of a public Act of Parliament passed in the year 1854? and having had your attention directed to complaints for which the Legislature has provided remedies, do you come here to ask for further remedies without knowing what the existing ones are?

Witness: It appears that I do not know all the existing remedies—this remedy by penalty, for instance.

Mr. BARROW: And without making any application to the public bodies, who have power to apply the remedies, before coming here?

Witness: What public bodies do you mean?

Mr. BARROW: I mean the Board of Guardians and the trustees of the consumers. I take it for granted that public bodies are liable to be called upon to perform their duties.

Witness: I know the question has been brought before the public bodies, and the impression prevailed that they thought they had not the remedy; and if they were ignorant of the remedy, I am not to blame for not knowing it.

Mr. BARROW: They were as ignorant of it as you are?

Witness: I suspect there must be some doubt or difficulty about it. It is a matter of notoriety that every vestry in London is complaining.

By Sir W. DUNBAR: There are doubtless some circumstances which might render a higher price for gas than 4s. 6d. necessary. I consider that it might fluctuate between 3s. and 6s.

By Mr. ADAMS: I am not aware that the existence of the trustees for the consumers is a fact recognized in the company's Act. I am quite ignorant of that Act of Parliament.

Mr. ADAMS: Although that Act is the foundation of the company and the rights of the consumers? As far as I understand, you have not made yourself acquainted, by an examination of the Act of Parliament, of the rights of the company, or the safeguards and privileges of the consumers?

Witness: The company was established before this Act was obtained. I was not aware of the privilege of the consumers to appoint an inspector of meters, and of a person to analyze the quality of the gas and test its illuminating power. I first became aware of the appointment of the trustees in 1855. We did make inquiry into the authority by which those persons assumed to call themselves trustees, but no one seemed to know much about the matter. It was an accepted fact that they were trustees, for documents were issued signed by them as trustees for the consumers.

Mr. ADAMS: And when you held the public meeting to which you have referred they were so completely recognized as trustees that the meeting proceeded to reproach them for sacrificing their interests? Did any one question their right to be considered as trustees?

Witness: There were some reproaches. They were recognized as having taken an active and influential part in gas affairs in Southwark; therefore their appointment as trustees did not excite any surprise, as they thoroughly understood the questions between the manufacturers and the consumers. It was a large meeting, and it was apparently an accepted thing that they were trustees somehow or other.

Mr. ADAMS: Then the companies could not be to blame for dealing with them as trustees, when the consumers in public meeting seemed to deal with them in that capacity.

By Mr. WHITBREAD: I stated that the trustees were not appointed at any public meeting of the consumers. Their acknowledgment as such at the public meeting was a negative assumption, and not a positive recognition. They had been instrumental in introducing the company. They did not get up and say they were not trustees. I do not think the question of trusteeship arose at all. They did not repudiate their office, and the consumers did not repudiate them. We did not know that they were trustees, how appointed, or when.

Mr. WHITBREAD: You mean that you are going to pass a vote of want of confidence in them—you repudiate their actions, but do not repudiate them as trustees?

Witness: I state that I am not aware of any act or deed by which the consumers generally appointed them as their trustees.

By the CHAIRMAN: I have been the medical officer of health of Bermondsey since the passing of the Metropolis Management Act in 1855. The parish of Bermondsey is a parish sole, and a vestry under that Act, and is not united with other parishes under a district board. The vestry is a corporate body, with a seal and the ordinary powers of a municipal body. My salary as medical officer is £200 a year.

The CHAIRMAN: The vestry of Bermondsey had power, under the 52nd section of the company's Act, to appoint a practical chemist to test the quality of the gas supplied by them, and the company were bound to afford him all reasonable facilities for doing so. Did you ever suggest to the vestry, in your capacity of medical officer of health, and as such receiving £200 a year, that they should enforce the provisions of this Act, and employ a chemist to test the quality?

Witness: No, I have many other more important things to suggest to the

vestry—the state of the Thames particularly. I did report, some time last year, that the gas was very impure, and damaging to the health of the inhabitants. A letter was thereupon written by the clerk to the company, and there was an answer by their secretary that the gas had not been purified.

The CHAIRMAN: Do you know that the vestry had power to give notice in writing to the company that the gas was inferior to the standard, and that, after such notice was given, they could impose a penalty of £100 upon them, with an additional penalty of £10 a day for every day it continued so?

Witness: There is one of the vestrymen here. I was not aware of it, nor am I answerable for its not being enforced. There have been penalties imposed for the lights being weak and going out, and for a diminished supply. There have been complaints to the Bermondsey vestry, but I do not know that any steps have been taken to enforce the penalty. I was not aware that the vestry could recover full costs of suit against the company.

The CHAIRMAN: Then are we to understand that in your capacity as chairman of this voluntary association you thought it right to take the chair at a public meeting, and come here and give evidence to the committee in reference to the supply of gas, and the necessity for some legislative remedy, and that in your capacity of salaried officer of health for Bermondsey, receiving £200 a year, you have not thought it your duty to bring this matter before the vestry, with a view to their taking proceedings under the 52nd and 53rd sections of the Act of Parliament?

Witness: I have already stated that I reported that the gas supplied to the district was of impare quality. In the other districts the Surrey Consumers' Act was put before me, and I perceive that the protecting clauses did not apply; therefore the public are suffering from the inconveniences which I have mentioned to the committee. I have made that report more than once in writing. I did so sometime in 1856. It was a matter of general complaint that the gas in the lower parts of Bermondsey contained sulphuretted hydrogen. When I did so, a letter was written by the clerk of the vestry to the company, giving him an extract from my report. In answer, a letter of explanation was sent, stating that by some error the gas had not been purified. Although such an effect was produced by a letter from the vestry, I have not thought it right to make any further representations to them. The matter was brought before the vestry by some of their own members. I have had many other more important matters connected with the public health to attend to, and I should have been thought to be going out of my province if I had done so. I am of opinion that I should have gone out of my province as the officer of health in doing so.

By Sir W. DUNBAR: I think, if I had to fix the minimum charge for gas, it should be 3s. There are increased facilities for bringing coal to London, and if any new coal-field should be discovered near London, gas could be manufactured much cheaper. I think at the present time 4s. would be a fair maximum price.

By Mr. LOCKE: My duties as medical officer are to inspect public buildings with reference to health, to report to the vestry any matters which might be prejudicial to the health of the district, and to suggest a remedy. It was not within the scope of my duty to make a report to them that the meters supplied to the consumers did not register properly; it would have been thought very impudent if I had done so. It was not within my duty to report to the vestry that 30s. was asked of any person, being a lodger, who wished to have the gas put into his room. I should have thought myself deserving of suspension if I had done so. I should have exceeded my duty if I had done more than report that the supply of gas from its impurity was calculated to impair the health of the inhabitants of the locality. That was the reason why I stated, in answer to your first question, that I did not appear here in my capacity of medical officer of health for Bermondsey. I was a little surprised at the question being put, as I did not see any connexion between my being the officer of health and my appearing here.

Mr. *W. Crosley*, examined by Mr. LOCKE.

I carry on business at 103, Southwark Bridge Road, as a gas-meter manufacturer. I have done so on my own account since 1855, but I was for several years in the service of my late relative Mr. Samuel Crosley, who, in connexion with Mr. Clegg, originally introduced gas-meters into use. That was as much as 40 or 50 years ago. Mr. Clegg was the originator of the gas-meter, and Mr. Samuel Crosley was connected with him in perfecting it. I have paid great attention to the formation of gas-meters, and I consider that some legislation is necessary upon the subject, as there is great liability to error and facilities for fraud in them. I know of cases which show that they do not always record truly. My firm are consumers of gas. We have two establishments for the manufacture of meters, at which we are supplied with gas by the Phœnix Company. I am also a consumer upon the mains of the Imperial Company on the north side of the water. In Southwark we have four meters—two of 60-lights each, one of 10-lights, and another of 20. The two 60-light and the one 10-light meter are at the Southwark Bridge Road premises, and the 20-light meter at the Emerson Street works. The Imperial one, of which I spoke, is at my private house in Westbourne Park. The meters at the manufactories are the property of the Phœnix Gas Company. I am not quite sure whether we rent them or whether the company allow us the use of them free of charge. There is an official tester of meters in that district—Mr. Mills. I am not quite prepared to answer the question by whom is he appointed. The meters I speak of bear the badge and seal of the official tester, who, I understand, is appointed to examine the meters of the four companies on that side of the river, viz. the Phœnix, the London, the Surrey Consumers', and the South Metropolitan, and see that they do not exhibit a greater variation from the truth than 2 per cent. either way. As a meter manufacturer, I understand that meters have to be submitted in that district to the test of the gasholder in Mr. Mills' possession, and that they must not vary more than 2 per cent. from the scale of the gasholder, either faster or slower. The City of London has another meter-tester. In some districts there is no official tester at all. There are two kinds of gas-meters—wet and dry. A wet meter has a circular drum inside, made of metal, divided into four compartments, and which is immersed in water beyond its centre or axis, the upper part being filled with gas. The dry meter is composed of metal, with a diaphragm inside of leather or some other elastic substance. I have a wet meter here. It is not one of my own construction; it is made by Jones, and is not exactly constructed like mine. I have here a model of a wet meter on my own construction. [Witness described by the aid of the model the different parts of a meter, and the method of its operation.] Each time the measuring-wheel revolves it is supposed to take a given quantity of gas with it, whether it does so or not depends upon the height at which the water stands in the meter. But you will observe that as the water-line may be varied either by over-filling the meter or by the evaporation of the water, so the capacity of that vessel may be altered from time to time. When the water-line is at the proper level, the meter will register correctly; when it is over-filled, it will register against the consumer; and when the water-line is below its proper level, it will register against the company. I cannot say that wet meters are never frozen, but it is very rarely the case. When they are, they stop. Meters are differently constructed as to the mode of regulating the water-line. Some are constructed with a plug in the side; others with an overflow-pipe in the interior. Some of those with a plug in the side are liable to be over-filled, to a serious extent, by keeping in the plug while the water is poured in until it runs over what is called the syphon-pipe. I am afraid that is often done, but I cannot say by whom. The effect is to make the meter register more gas than actually passes through, because this index, which is generally supposed to represent the number of cubic feet of gas consumed, is, in point of fact, a record of the number of revolutions made by the measuring-drum. [Witness explained the machinery by which the drum is connected with the index, and the mode in which its revolutions are recorded.] If, therefore, the water is filled to a higher level than it should be, the meter registers against the consumer, because the capacity of the chamber for gas is reduced. It does not affect the light unless filled to such an extent as to become water-logged, but it does affect the measurement; because if, for argument's sake, we suppose that 100 revolutions of the wheel take with them 100 cubic feet of gas when at its proper water-level, it is quite clear that, if you occupy part of the chamber to the extent of 50 per cent. of its capacity with water, you have only half the quantity of gas passing through, though you have the same number of revolutions.

Mr. LOCKE: Yes; but if the burners are lighted in precisely the same way, there would be the same quantity of gas going through that portion of the pipe to make the light?

Witness: You cannot get the light if you do not get the gas.

The CHAIRMAN: If there are 50 feet of water or 20 feet, the consumer loses 50 feet or 20 feet of what he would have had if all had been gas?

Witness: I do not quite clearly understand the question.

Mr. LOCKE: Just state how that is? (A laugh.)

Sir JOHN SHELLEY: Put the question again.

Mr. LOCKE: How is the consumer affected? Is he damaged?

Witness: If the water is too high in the meter he is damaged.

Sir JOHN SHELLEY: How is that?

Witness: Because part of the chamber which should be occupied by gas is occupied by water, and still the index registers the revolutions.

Mr. LOCKE: And the consumer pays for the revolutions when it is filled with water, whereas he ought only to pay for it when it is filled with gas?

Witness: Partially; if filled entirely with water it would not go.

Sir JOHN SHELLEY: Who regulates this water?

Witness: The gas supplier—the company.

Mr. LOCKE: Do they send from time to time to look at the meter?

Witness: Yes.

Mr. LOCKE: Do you of your own knowledge know that too much water has been sometimes put in?

Witness: I never saw a man do it, but I have been on his track soon after. I cannot, therefore, speak from personal knowledge, further than that I have been soon after a man has been to a meter and poured water in it; and I have found the meter overcharged, and have been informed that no one has touched it since. It is the person who belongs to the gas company that regulates the meter—not the official tester. The tester is an independent person, and has nothing to do with a meter after it is fixed in a house, unless some dispute arises; and the meter is then taken down and examined, to ascertain whether there is anything incorrect in it or not. The evil of which I now complain does not form any part of the official tester's duty to remedy. His duty is to test the meter at the water-line, to see if it is correct at that line; but what I complain of is that, after he has tried it and found it to be right at that point, there is another point at which the meter can be filled, to which, as I understand it, the official tester's attention is not drawn.

Mr. LOCKE: Tell us what is that other point.

Witness: This (pointing to model) is what is generally termed the water-line, and what he has to test is whether it is correct or not at that point; and, as far as I understand it, when he has done that, his duties are fulfilled. Then there is what is called the syphon pipe or spout which conveys the gas to the meter. This stands at various heights. It may stand at an inch in some meters, and in others more, above that level. Supposing, therefore, a person charging a meter with water, instead of taking the plug out, which the official tester may have found to be correct, he charges with water up to this level (describing), it is quite clear the water will stand higher than it should do. I am not aware that the official tester looks to this pipe; I do not know how his duties are defined, but I believe they are limited. As I understand, the meters are tested by him before they are allowed to be put up, and subsequently, if any dispute arises between the supplier and the consumer, it may be referred back to him.

Mr. LOCKE: But when it is referred back to him, and he comes to look at it, do I understand you to say that then the only duty he performs is to see whether the meter registers properly when the water-line is correct?

Witness: I believe that is the case.

Mr. LOCKE: And he does not examine whether, by improperly filling that—what do you call that thing? (A laugh.) The syphon—where the water-line is?

Witness: The side-plug?

Mr. LOCKE: No, no; this?

Witness: The case.

Mr. LOCKE: The water is in the case, is it not?

Witness: Yes.

Mr. LOCKE: And he ought to put it up to a particular water-line?

Witness: He should.

Mr. LOCKE: But he puts it up further than the water-line, and it runs into the pipe?

Witness: No, not when doing that.

Mr. LOCKE: But is it done?

Witness: It is.

Mr. LOCKE: By whom?

Witness: I do not know who does it; all I know is that it is sometimes done.

Mr. LOCKE: But when the meter-tester comes again on the second occasion, he simply examines the case and examines the water-line, but does not examine any other part to see whether the water has been improperly put into it?

Witness: Quite so.

Mr. LOCKE: The inspector of the company looks at the meter every quarter to see what has been registered?

Witness: There are different rules with different companies, but I believe he does. Sometimes he puts water in, and sometimes, I understand, he does not. I tested the meters on our premises in Southwark on the 19th instant.

I found that at the water-line, when properly filled to what is termed its proper level, one of the 60-light meters registered a little against me—between 1 and 2 per cent. That was within the limit permitted by the arrangements with the companies. The other 60-light meter was about a quarter per cent. against me. The 10-light meter was about 1 per cent. against me at what is termed the true water-line. I then filled up the meters to the height of the top of what is called the syphon-pipe, to see what the effect would be against me if any one had filled the meters either carelessly or otherwise. I found that one of the 60-light meters in that state would be between 10 and 11 per cent. against me, and the other 60-light meter between 11 and 12 per cent. against me, and the 10-light meter about 13 per cent. against me. These are the meters at our Southwark Bridge Road premises.

Mr. LOCKE: Is it your opinion that the duty of these testers ought to be applied to a further examination than that to which they go?

Witness: Unquestionably; they ought to extend to an examination of the syphon-pipe, or any other pipe by which water would be maintained within the meter above this level: it does not necessarily require that it should be the syphon-pipe, to prevent being filled above the proper level. Here is a method by which it could be, and is accomplished (explaining model). I have a meter at my residence at Paddington. It is a 20-light meter of Parkinson's make. It does not belong to the Imperial Company. They would not supply me with one; I understand it is against their rules to do so. I must explain that at the time I got it there was opposition in some parts of their district, and in other parts there was not any. Where there was none they compelled the consumers to buy their own meters; where there was opposition they supplied them on hire. There was no opposition in the part in which I resided. The meter which I obtained was tested by the company and was passed as correct. I tested that meter myself on the 21st inst., and I observed that it was a little against me at the water-line. By filling it up in the same way that I have explained in the other case, to the level of the syphon-pipe, it would record about 24 per cent. against me. At No. 9, Westbourne Park, on the Imperial Company's mains, I examined a 10-light Parkinson's meter on the 21st inst. I was told by the servants that the company's inspector had been there on Friday or Saturday previously, and that he put water in the meter then. I found that it contained 30 cubic inches of water above the proper level, whereas it should not have had any above. This made an error in its registration against the consumer of about 2½ per cent. I cannot pledge myself to the precise quantity, because gas is an elastic fluid, and it is difficult to determine it to a mathematical nicety. The meter was capable of being over-filled, so as to create an error of between 13 and 14 per cent. I think it would not work beyond that. The consumer has no security whatever against the company putting too much water in meters so constructed, only by becoming acquainted with the subject and looking after his own interest.

Mr. LOCKE: I think what we have seen to day, so far as I am concerned, shows that there is a difficulty about it. (A laugh.)

Witness: I am better able to look after my meters, as I make them, than some persons are. I believe there is a great deficiency of knowledge among gas consumers about their meters, and many of them have something else to do.

Mr. LOCKE: Would you suggest anything?

Witness: I would suggest that in all wet meters there should be a pipe, or tube, or overflow arrangement, so that the water will not remain in the meter beyond a certain level, and that that shall be the proper level. It is done by some manufacturers.

Mr. ADAMS: Does it apply to yours?

Witness: It does.

By Mr. LOCKE: I make meters for some of the companies; but, if you will pardon me, I should not like to communicate the names of my clients. I am not prepared with a list of the companies for whom we manufacture. I may mention one or two. I manufacture for the gas company at Belfast, the Dublin Alliance Company, some for Liverpool, and a few for the Chartered, in London. I have made three, I think, for the Phœnix, and one for the Commercial Company. They have generally succeeded. At 82, Westbourne Terrace, there was a meter in use at the house of a friend of mine. It belonged to the consumer, was made in 1851, and, at the time I examined it, was worn out. It depends upon circumstances as to how long they will last. I have had meters sent to me for repair and alteration to our patent principle that bear the date of 23 years back. My friend was obliged to get another meter. She was not obliged to get it from any one in particular, but Mr. Woodward, the inspector of the Imperial Company, gave her the names of two or three makers to select from. I believe that company not only oblige the consumer to buy his own meter, but to be at the expense of any repairs they may think proper should be done at any time.

Mr. LOCKE: And if the meter does not mark as much as they wish, do they claim to take the record of a corresponding previous quarter?

Witness: I believe, if there is any doubt upon their minds as to the meter requiring repair, they claim the right to do it.

Mr. LOCKE: Do you consider that is fair if the meter is leaky and out of order?

Witness: If the meter is leaky and out of repair, I do certainly.

Mr. LOCKE: Do they require evidence that it is out of repair?

Witness: I have never heard that they do require it or obtained it. I believe it is generally understood that, if there is any doubt——

Mr. LOCKE: That they refer to the quarter before, and charge him that?

Witness: I do not say that; I say if the meter is out of repair. In my own house there have been instances in which I have not consumed as much as in a previous quarter, and if they had made such a demand I should have resisted it, because, if they compel me to supply my own meter and are satisfied by testing it that it is correct, they must be bound by it. I consider that I have not freedom of action unless they do.

Mr. LOCKE: Do they take your consumption at the maximum of any corresponding quarter?

Witness: In my case I am not aware that they have taken anything except the state of the index. I am not aware of a case of that kind having occurred. I merely speak of it as a general rule. I do not know of an individual instance. I examined the old meter at Westbourne Terrace, which is the one now produced, and I tested it to see how much it would register against the consumer at the level of the syphon-pipe as before. I found that it would register between 21 and 22 per cent. against her. I then had the front taken off to see if there were any traces of the water having been filled up to that level at all, and I found a very distinct mark (exhibiting meter) left by the water. This (pointing to a mark) is the level at which the water should be adjusted, and which it should never be above. That (pointing to another mark) the top of the level of the syphon-pipe.

Mr. BYNG: Your meter would have prevented that?

Witness: Yes. The water having remained at this level in the meter shows that it has been over-filled. It is quite clear, from the marks upon the meter, that it has been very frequently and for a long time at least 8-10ths of an inch above the proper level.

The CHAIRMAN: From the appearance it now exhibits you think it has been frequently overcharged with water?

Witness: Unquestionably; any practical man will tell you so.

The CHAIRMAN: But the meter being in the condition of registering against the consumer, I understand it was the gas company which suggested that she should get a new meter?

Witness: No; the consumer found it out from the inconvenience of her lights going out so repeatedly. The complaint arose with the consumer, and I suggested the propriety of a new meter being obtained. I wrote a letter to the office of the company to know from whom a new meter should be bought. I got no answer, and then I applied to Mr. Woodward, the inspector, because I found a difficulty. The company would not allow you to get a meter from whoever you please. The inspector gave me some names of makers, which I cannot now tell you. They are persons well known in the trade as makers of meters. I do not know whether they are favourable to the Imperial Company.

The CHAIRMAN: Are they the names of persons of character and ability?

Witness: Generally speaking. I do not know anything against them.

Mr. LOCKE: Do you know anything for them? (A laugh.)

Witness: I do not know that I should know them if I saw them. I only know one firm, that is Parkinson and Co., and that is a highly respectable firm.

Mr. LOCKE: Was that Mr. Parkinson referred to by the Imperial Company on this occasion?

Witness: Yes.

Mr. LOCKE: Did the meter then supplied in the place of the one made in 1851 have the overflow-pipe which you put into yours?

Witness: No.

Mr. LOCKE: Is the overflow-pipe your patent?

Witness: I have a patent for regulating an overflow-pipe, but there are others which are not my patent.

Sir B. HALL: I understand you to say that you examined the meter and found that, if properly filled, it registered a very small variation against the consumer—we are speaking now of the one at No. 82, Westbourne Terrace?

Witness: I do not recollect to have said that that did so.

Sir B. HALL: Then do I understand you to say that the meter which you examined, if properly adjusted, would register properly for the two parties, the gas manufacturer and the consumer?

Witness: I believe it would.

Sir B. HALL: But you found, on examining the meter, that there were certain marks clearly indicated in that meter that it had been over-filled above that line which would fairly determine the point as between the gas manufacturer and the consumer? I understand you to say that upon examination you found, from marks upon the meter, that it had been filled to about 8-10ths of an inch above that line at which it ought to stand in order that the manufacturer and the consumer might be fairly dealt with?

Witness: That is true. The consumer, being dissatisfied with her meter, wished to have another, and the inspector of the company, Mr. Woodward, submitted to her a list of manufacturers, from whom she might choose one to supply it. I know generally the meters which are manufactured by those persons. Some of them do and some of them do not supply meters with the overflow-pipe, which I consider necessary to prevent fraud and to secure fair dealing between the company and the consumer. The name of the maker selected in this case was Smith. I do not know whether he supplies meters with the overflow-pipe; I only know that the meter which was procured from him was presented to the Imperial Company to be tested and was passed, but it could be over-filled. It had no such overflow-pipe as I mean at the water-line.

The CHAIRMAN: Did the consumer consult you before she went to Smith?

Witness: Yes.

The CHAIRMAN: And did you advise her?

Witness: I said, the Imperial are very "imperious," and you had better submit.

By Sir B. HALL: I tested the meter so supplied, and I found that the pipe was placed at such a level that if the water was filled up to the point of overflow there would be so much water in the meter as to damnify the consumer to the extent of about 5 per cent.

By Mr. LOCKE: There is a stable at No. 6, Westbourne Park Mews, South, where I was anxious to have a meter of my own manufacture. I applied to——

The CHAIRMAN expressed an opinion that as the committee had decided upon taking the case as affecting the south of London first, it was not expedient to go into matters occurring on the other side of the river.

Mr. LOCKE said his object now was to show the importance of having an inspector of meters, and to do so, he was showing the mode in which meters were manufactured, and the opportunities which the companies had of obtaining an unfair advantage. He thought, therefore, that whenever he met with such a case he ought to submit it to the notice of the committee. It was not a question which confined itself to one side of the river only.

Examination resumed: The stable was not let at the time, but it was desired to have gas in it. An application was made to Mr. Woodward to have it laid on, which was done, and all the fittings were put up except the meter. A question arose as to whose meter should be employed there. I wanted to have one of my own make, but they told me I was not an authorized maker, and until I was, they could not allow their gas to pass through my meter. I then applied to the directors on the subject, and submitted my patent meter, with the overflow-pipe, to their attention. As far as I could judge they appeared to be very well pleased with it, but they had previously told me to submit it to their three engineers for examination, and if approved they would allow it to be fixed. I had done so before this meeting, and the engineers appeared to approve of it. When I went before the directors, two of these engineers were present, and, as far as I could gather, they appeared to approve of it; but I was told by, I believe, the governor—though I must confess I think it was one of the directors who sat next to him that suggested the idea—that I must wait for three months longer. Now, I considered that at that point I had fulfilled what was required of me, and three months at that time of year was tantamount to shutting me out of the business of the season; therefore I was not pleased with the course they adopted. I considered that it was very arbitrary, after having fulfilled the demands made upon me by the directors, to be told that I must have another probation of three months, and I was much annoyed.

By the CHAIRMAN: I think this was in the year 1856. The stable did not remain in darkness during the whole of that time, because they pro-

mised to lend me a meter—which they did; but at the end of three months they demanded it back, and rejected my application, because I had not submitted mine for three months to their inspection. I had then to purchase a meter of another maker. I submitted one to them and they rejected it, as they complained something about the index. It was one of Edge's meters. I then obtained one from Milne and Son, and they rejected it on the plea that it could be made to register 15 per cent. against them, or "slow," to use their own expression. It was not until March last year that one of Hulett's was obtained and fixed. That was one of the makers whose names they had given me before. The meter so obtained has answered, so far as registration is concerned. I have nothing to complain of, but it has evinced evident symptoms of decay. Another was placed by the side of it which has acted very well. That is one of my own. It is in very excellent preservation, performs its functions properly, and shows no symptoms of decay.

By the CHAIRMAN: It was put up three or four months before Hulett's.

By Mr. LOCKE: I consider it hard upon the consumer to be compelled to buy an inferior meter and to have to pay for keeping it in repair, or to be surcharged a higher rate per quarter for his gas on the plea that his meter is out of repair.

Mr. LOCKE: Do you consider it necessary that a standard measure of a cubic foot of gas should be established by Act of Parliament?

Witness: I do.

Mr. LOCKE: Do different meter-makers use different standards?

Witness: I believe that they do not all agree.

Mr. LOCKE: Do all gas companies give the same measure?

Witness: The gas companies' measures are not all alike.

Mr. LOCKE: Does the Liverpool Gas Company give more gas than Manchester?

Witness: Yes, for the same nominal quantity. I believe the Liverpool measure is right according to the Act of Parliament. I consider the Manchester measure is, therefore, too small.

TUESDAY, JUNE 29.

The committee reassembled this day at twelve o'clock, and sat with closed doors for upwards of half an hour.

On the public being admitted,

The CHAIRMAN requested to know if any gentlemen were present representing the Western and the City Gas Companies, as he was anxious to call their attention to column 5 in the return which they had made, and to request that they would furnish the committee with fuller information under that head.

Mr. BARBER, of the Western Company, said that he had that morning furnished an amended return.

Mr. *Crosley* was recalled, and examined by Mr. LOCKE.

[After suggesting two or three verbal alterations in his former evidence, witness said:] Since I was last here I have made an experiment with the 20-light meter at my Emerson-Street premises, and I find that, at the proper water-line, it is 1¼ per cent. fast, and about 11 8-10ths per cent. at the spout-line; that is against the consumer. I am not so well prepared to give evidence respecting dry as wet meters, although I have evidence upon the subject. The mode in which they register against the consumer is very much the same as that by which the result is produced in the wet meters. The dry meter has chambers—some have two or three—and it depends upon the capacity of the chambers what amount is registered. If the chamber is larger, it will register less; if smaller, more gas than is consumed; and it is liable to register in both these ways of itself, without any application to make it do so. There is no doubt about the wet meter being the safer of the two, if you can keep the water at its proper level. The dry meter gets out of order of itself, and there are modes of tampering with it.

By the CHAIRMAN: I am not a manufacturer of dry meters.

By Mr. LOCKE: I have examined 36 meters taken indiscriminately over a large district as they were working. They were in Manchester, but of London make, and the same description as those usually employed here. I hand up a copy of the results of those experiments.

Extract from a Report made by Mr. W. Crosley to the Gas Committee of Manchester, on the 15th of January, 1858, giving the Result of his Investigation of Thirty-Six of their Meters, taken indiscriminately.

The twenty-four meters out of thirty-six, which were found to be over-filled with water above the regulated water-line, were:—

Letter of Reference to Experiment.				
A	1	10-light	which was over-filled with water to such an extent above run-off plug as to cause it to register	1 per cent. more gas than consumed.
B	1	2-light	ditto	1 2/10ths do.
C	1	3-light	ditto	1 2/10ths do.
D	1	10-light	ditto	1 2/10ths do.
E	1	5-light	ditto	1 2/10ths do.
F	1	3-light	ditto	2 3/10ths do.
G	1	10-light	ditto	2 5/10ths do.
H	1	30-light	ditto	2 7/10ths do.
I	1	3-light	ditto	3 3/10ths do.
J	1	3-light	ditto	3 3/10ths do.
K	1	5-light	ditto	3 6/10ths do.
L	1	5-light	ditto	3 7/10ths do.
M	1	3-light	ditto	4 1/10th do.
N	1	5-light	ditto	4 5/10ths do.
O	1	3-light	ditto	5 2/10ths do.
P	1	10-light	ditto	5 9/10ths do.
Q	1	3-light	ditto	6 3/10ths do.
R	1	5-light	ditto	8 6/10ths do.
S	1	3-light	ditto	11 3/10ths do.
T	1	10-light	ditto	11 4/10ths do.
U	1	3-light	ditto	12 9/10ths do.
V	1	5-light	ditto	15 1/10th do.
W	1	3-light	ditto	27 7/10ths do.
X	1	3-light	ditto	35 do.
Overcharged above run-off plug	24			
	2	3-light	Not filled above the level of run-off plug.	
	4	5-light		
	3	10-light		
	2	20-light		
	1	30-light		
Total number examined.	36			

They were all made by one manufacturer—Parkinson and Co. or their predecessors, I am not prepared to say which. That is a highly respectable firm.

The CHAIRMAN objected to this evidence as irrelevant.

Mr. LOCKE said his object was to show that of 36 meters which had been examined 24 by over-filling had been made to defraud the consumer, and that was to prove the necessity of having some other description of meter used, or, at all events, that some independent person, irrespective of the tester who had been spoken of by the witness, or the inspector appointed by the companies, should be appointed to examine the meters, and see that in that way the consumer was not being defrauded. If the chairman thought it necessary, he would go through each of the items handed in by the witness.

The CHAIRMAN said he thought it was sufficient for the purpose that the witness should say he had known of the circumstance, and having examined 36 meters, he had found 24 inaccurate.

Sir JOHN SHELLEY: The question was, whether what had happened in Manchester might happen in London, and it would be the business of the committee to ascertain that.

Mr. LOCKE said he would not go through the list to show how much each meter had registered against the consumer, but would take the highest and the lowest.

The CHAIRMAN said it would be enough for the honourable member's purpose to say it was from 1 to 35 per cent. against the consumer.

Sir B. HALL said, if the parties representing the gas companies would give an intimation that in any legislation which might be adopted there would be no objection on their parts to the appointment of an inspector of meters, he thought the committee might dispense with this evidence.

Mr. HENRY (secretary of the Imperial Gas Company) said there would be no objection at all to it.

Mr. LOCKE, as representing the south of the metropolis, would like to have some such intimation from the companies on that side of the river.

Sir W. HAYTER said he had intimated that they were willing to accept the provisions contained in the Imperial Company's Act.

Mr. LOCKE inquired whether there was a clause in that Act authorizing the appointment of such an officer.

Mr. HENRY said there was not. The clauses had reference to the illuminating power of the gas, but the companies had no objection

The CHAIRMAN thought the inquiry had better go on.

Examination resumed: Yesterday I made experiments on several three-light wet meters, constructed by different makers, used in London and elsewhere, and each of them passing an ample supply of gas for three argand burners at the low water-line.

Result of Experiments made on the 23th of June, 1858, on sundry Three-Light Wet Meters, of different Makers, and used in London and elsewhere.

(The meters in each case passing an ample supply of gas for three argand burners at the low water-line.)

Meter.	Registration at the Regular Water Level. Per ct. Fast.	Per ct. Slow.	Registration at High-Water Level. Per ct. Fast.	Per ct. Slow.	Registration at a Low Level. Per ct. Fast.	Per ct. Slow.	Difference in Registration between the Water being at High and Low Water Level with 3 Argand Burners full on.
A	0·00	0·00	64·47	—	—	5·30	69·77 per cent.
B	0·5/10ths	—	37·74	—	—	3·84	41·58 ,,
C	0·2/10ths	—	16·55	—	—	5·30	21·85 ,,
D	—	3·56	10·61	—	—	7·91	18·52 ,,
E	0·8/10ths	—	10·37	—	—	9·09	19·46 ,,
F	2·45	—	9·40	—	—	2·15	11·55 ,,

Memorandum.—The term "fast" means against the consumer. The term "slow" means against the supplier. The meters supplied to witness by the Phœnix Gas Company are made by the maker of A. Those marked A, B, C, E, F are in the list of names furnished to witness by the Imperial Company, from which to select his meter-maker. That marked D was not in the Imperial list.

When I was with my late relative meters came in for repair sometimes, and I have frequently noticed that the water-line has been beyond the mark at which I should expect to have found it. I have often seen it. I recollect paying my quarter's gas account for my Southwark premises on the 12th of January last to Mr. Benjamin Phillips, the collector of the Phœnix Gas Company. Mr. Phillips then stated to me that he had heard complaints frequently from consumers, when passing over his district shortly after the inspector had been to inspect the meters and attended to the water-line, with respect to their lights going out. He said he reported those complaints, and he stated that he had frequently heard that after drawing off the water the lights went on properly. I particularly noticed this, because he said "draw off," and I requested my gate-keeper, who was present, to observe the remark. My inference from it was that the meters had been overcharged to such an extent as to choke up the syphon. I have not given my attention much to the subject of gas companies refusing to supply gas to consumers, nor of their supplying meters at a fixed rental, only in so far as this, that I think they should do so when required.

Mr. LOCKE: I believe you have some evidence to adduce with respect to your examination of certain meters in the metropolis. Is there one at Grape Cottage, Church Street, Chelsea, made by C. Botten—"Patent Protector, 23,735"—date of make, 1848?

Witness: There was. I understand the gas was originally supplied by the Imperial Company, and is now supplied by the London Company. This meter is capable of recording against the consumer to the extent of 13½ per cent. when filled to the spout. It appears, from the internal evidence of the water-mark to have been worked at that point, or between that point and the proper level. I produce that meter. It is the property of the consumer, who desired me to put a new one in lieu of it. I have on several occasions been obliged to decline orders, because of the Imperial Company not having granted permission for my meters to be fixed on their mains, and consequently my customers have been disappointed in not having my meters. With respect to Mr. Perkins, Mortimer Street, Langham Place, he is a consumer on the Imperial Company's mains. Some years back the company complained to him that his meter was out of order, and required him to have it repaired directly. They told him he must send it to a particular maker, whose name, I think, was Botten. The meter was away about ten days to be repaired, and a paper was left with the consumer, I believe, showing the state of the index at that time. When the meter came back the index was advanced 4000 feet. Mr. Perkins told me that he refused to pay, and the officers of the company told him that he might appeal. He did appeal to the directors, at the offices in John Street, Bedford Row, but he got no redress, but was still charged the 4000 feet, which he refused to pay; and the consequence was, that one day when he came home to dinner he found that his gas had been cut off without any notice to him whatever, and he was obliged to pay for the extra 4000 feet, with an additional claim of 5s., in order to get it put on again.

The CHAIRMAN suggested to Mr. Locke that this case involved a matter between Mr. Perkins and the company, and came before the committee in a very indefinite way.

Mr. LOCKE said he quite agreed that it was not evidence that could be accepted in a court of law, although the witness was deposing to facts stated to him by Mr. Perkins.

Examination resumed: I have stated it as my opinion that it is very im-

portant there should be some legislation with reference to meters. At present I do not think they are so satisfactory as they ought to be, and my reason for saying so is that meters unquestionably get very bad, and I think there are others which are less liable to variation than many of those now in use. I think that some wet meters are decidedly the best, and I am confirmed in this conclusion from the fact that gas companies invariably use wet meters for their station-meters and for all their experimental purposes. I do not know a case where a dry meter is used by a gas company, or by persons who wish to arrive at accuracy to any great extent. I do not think that all wet meters are less liable to be tampered with, or afford less facilities for consumers committing frauds. There are several constructions of wet meters, and some afford more facilities than others.

Mr. LOCKE: Are there any which do not afford facilities?

Witness: That is putting a very home question.

Mr. LOCKE: I do not wish to ask about your meters. Other people make wet meters as well as you: but are there any meters of such construction?

Witness: I think the patent meter which I supply is less liable than many others; but I should not have said so but for you having asked me the question. Other makers do not supply my patent, or any machinery of a similar kind. They construct meters with an overflow-pipe, but that is not my patent, and I do not consider it the most important. The most important is the provision for maintaining the water-line up to its proper level. The fact is, its original object was to protect the interests of the gas companies by enabling them to maintain the water-line up to its proper level, upon an assumption of the well-known fact that the water evaporates, and that if the water-line is regulated to-day, and you go again three months hence, you will find it has got lower. The object of my patent was to maintain that by a service-reservoir and apparatus inside, and so protect the interest of the companies; but when I came to introduce it I found, instead of the water being below, as I naturally supposed it would be when the meter is treated fairly by all parties, it was often found to be above; therefore, that is an illegitimate mode of compensating for evaporation. My meters will supply the deficiency for a certain time; of course not for ever. As far as the reservoir is concerned, my patent is no protection to the consumer. I do not consider that the consumer requires any protection at that point. That which usually acts against the consumer is the fact of there being too much water in the meter, so that it is above the proper level; and the pipe in my meter, which carries the surplus water off, is the remedy for that. There are many other makers who supply meters with the overflow-pipe. Some gas companies have an objection to these meters—others use them. They are not so generally used as the others, though there are many in use in various parts of the country. There may be a few in London, but the proportion must be remarkably small to the others. In some towns they use them exclusively—in Liverpool, almost entirely. I cannot say that the cases in which they are used in London are exceptional, but that the proportion is very small.

Witness, at the request of Sir William Hayter, explained on the meter produced the position of the true water-line, and the level at which the water would stand when the registration was for or against the consumer respectively.

Examination continued by Sir W. HAYTER: My father and the late Mr. Samuel Crosley were cousins. The latter died in my arms in 1845. I had been connected with him for five years, and had not left him to engage in any other pursuit He was succeeded in the business by his brother John, but I did not continue with him. Subsequently I was engaged in railway matters, and, when the works which I undertook were completed, I continued in engineering pursuits, until I undertook gas-meter making in 1855. On the death of Mr. John Crosley the business was carried on by Mr. William Parkinson, as trustee in the first instance for Mr. Crosley's widow and representatives. Mr. Parkinson has been dead three or four years, but the business is still carried on by the firm of Parkinson and Co. I never had any connexion with the firm of S. Crosley at any time, other than being a servant of my late relative up to 1846; and, therefore, I did not represent in any way that firm. There is a partner in my present firm of Crosley and Co. Mr. King is not a partner of mine; he has no more to do with me than you have. This (referring to diagram) represents the interior works of my meter. It appears to be complicated, but is not so in fact. I may explain that we have various modifications of the meter, and do not make them all exactly alike. I have made three meters for the Phœnix Company and one for the Commercial Company in London. I speak from memory, not being prepared to answer such an inquiry. We have made several thousands since 1855, and have altered many old ones. This (meter produced) is one of our meters. I do not know when it was supplied. The date of it is 1856, which was the date of the patent and year after I commenced business. The number of it is No. 47,001, but that does not imply that I had made that number of meters up to that time. The patent number is the correct one; the other is not with a view to delude the customer, but for the purpose of identifying the meter. I only know this as a reference in our books.

By the CHAIRMAN: I do not know with what number we commenced. I do not know how many thousand meters we gave ourselves credit for.

By Sir W. HAYTER: We have supplied meters in Liverpool, Belfast, and other places. If I had been aware that the question would have been asked in reference to our different customers, I should have been prepared. We have supplied very few meters in London. I sent a meter for trial at one time to the London Gas Company. I cannot undertake to say when, but I think it was sometime in 1856. That trial proved satisfactory to me, but not to Mr. Jones. I must explain to you that it was a glazed meter—not a common one for commercial purposes. It was a meter with a glass front; that front was put on with soft putty, and, after meters of that description have been at work a little time, the water and gas act upon the putty, and cause the meter to leak. I believe in this case there was a leakage at the putty joint; they are constantly liable to do so, and I do not like to supply them for that reason. If my memory serves me correctly, it was not supplied for the use of the company, but it was submitted to them with a view to prove that the meters we supply are good ones, and the glass front was for the purpose of showing how the water rises from one chamber to another. I do not deny that the object was to obtain business from the company. On that occasion certain defects were not pointed out to me. Mr. Jones told me he had heard from some one else that something could be done with the meter, but he told me that he could not speak as the result of his own experience. I can positively deny that it was shown to me that, by tilting the meter, gas could pass through without registration; and my reason for knowing that is, that I fixed the meter myself on a shelf and sealed the screen, and it had not been moved.

Sir W. HAYTER: I ask you expressly whether the meter you presented to the London Company was not a meter very liable to be tampered with to the prejudice of the company, inasmuch as by tilting it any quantity of gas could be made to pass without registration; and this was pointed out to you? Do you deny this? I want a plain answer to a plain question.

Witness: That meter had not been.

Sir J. SHELLEY: He has made the same answer before.

Witness: There was an attempt made to prejudice the meter when it was first introduced, because it was, at the cost we made it, the nearest approach to perfection. We aimed at accomplishing certain things in that meter which we did accomplish; but there are certain defects in the old meters which we allowed to exist in that particular meter; but these were not the points we aimed at, and it was as good a meter as any other in these respects. I do not remember that it was pointed out to me that any quantity of gas could be made to pass through without registration. I recollect going there and seeing Mr. Jones, and he said he had heard something from some one else, but he had not tried the experiment. The company have since used six of our meters of another construction. I do not know whether they are in use now. They were what is called ordinary low-spouted meters, and I have since heard that they have had them altered by another maker to high-spouted ones. I have supplied one or two meters to the Commercial Gas Company.

Sir W. HAYTER: Was any representation made to you, or do you know whether a similar result occurred with one of those meters as with the one supplied to the London Company?

Mr. LOCKE: That is not a fair question, because he denies that any result occurred. He says some one told him that another man had told him something.

Witness: Mr. Jones, of the London Company, told me himself distinctly that he had not produced any such result, but he had heard of it from some one else. Mr. Jones, of the Commercial Gas Company, told me that he could obtain gas unregistered from the plug underneath. I must explain to you that this is a complaint which applies to nearly all wet meters, and it is not fair, I maintain, on the part of the London Company, to bring that forward as a peculiarity of my meter, which exists in almost every wet meter that was ever made, and which it forms no part of this patent to remove—I mean the being able to obtain gas from the lower plug. Because my meter is a low-spouted one apparently, wherever I go this is brought forward as a charge against it, whereas it exists in nearly all wet meters, and forms no part of that patent arrangement. I found myself met with the remark that mine were more expensive machines, and I was obliged to have them constructed with as little additional expense as possible; and in doing so I took out certain arrangements which we now put in, in consequence of finding myself attacked in the way I have been by the London engineers in making this a pointed charge against our meter.

The CHAIRMAN: Do I understand that this complaint has been made very frequently?

Witness: We now arrange it so that the thing does not now exist, and has not done for nearly two years.

Sir W. HAYTER: All I want to ask you is for an answer to my question. I find now, as I understand, that your meters have been objected to, and that you have altered them; but still, whatever your opinion of them may be, the companies do not share in your appreciation of them?

Witness: Not all; I wish they did. Some do.

Sir W. HAYTER: May I ask you if you came here as a volunteer witness, or at the summons of the chairman, or at the suggestion of the committee?

Witness: I came here as a consumer; as a manufacturer also, if you please, while I am here. I was asked to give evidence; I was not summoned.

The CHAIRMAN: All the witnesses are volunteers up to the present time.

Sir W. HAYTER: Have any meters arrived at the point of perfection so as to be absolutely sure in registering the quantity of gas consumed?

Witness: I do not think that anything has arrived at perfection; but I believe this meter, when all the apparatus is in it which we put in to make it complete, is as near perfection as any meter brought out. The existing meters in one state of circumstances act against the consumer; in another against the company. In the meter which I produced on the former occasion there are several water-lines; two of them are very strongly marked ones and are against the consumer, and there is only one mark against the company, which is not clearly defined. [Meter produced and examined.]

Sir W. HAYTER: Is it not a matter of constant occurrence that by evaporation, or some more direct means, the water can be or is diminished in the meter so as to register against the company?

Witness: Decidedly; it is well known. It is a very simple matter for the consumer at any time to extract water from the meter—that is, from a common meter.

Sir JOHN SHELLEY: Do you say it cannot be done from yours?

Witness: Not with that facility. I have constructed wet meters so that you cannot get the water out at all without extinguishing the lights.

By Sir W. HAYTER: There are other meters so constructed as to aim at the same object by different means. The object of my patent was to compensate for the diminution of water by evaporation. Patents have been taken out for such objects; whether they have succeeded or not I am very doubtful about, but am not prepared to answer. I have seen meters on another principle which profess to do so, and for a time they have answered, but whether they have continued to do so I do not know. It is a question of time, and I do not think the experience has been quite long enough. I cannot tell the names of the makers of such meters. [List of meter-makers in London handed to witness.] There is a maker whose name I do not see here—Mr. Mead—he has a mode of compensating for evaporation His address is in London. Hulett's name is here. I do not know that they do. These are not the names of patentees, and there are patentees who are not manufacturers. For instance, I know one in Dublin who is not a maker, and I have heard that he gets his made in London. I mentioned in my evidence before that the Imperial Company would not permit my meters to be put up except they were tested for three months. Mine were not so tested, because I was not told that it was required until I had complied with what I was told would be required in the first place. They told me that my meters must be submitted to their engineers. I complied with their request. I do not know at what time it was exactly, but it was shortly after the patent was obtained. It was before I made what I considered the alteration to meet the requirement referred to; but I withdrew the first meter and submitted one that was so altered that the gas could not be surreptitiously obtained from the lower part. The three engineers expressed themselves satisfied with it; I can say that positively. I afterwards saw the directors, who required a three months' trial. I considered that was an additional imposition upon me, as I had never heard till then that they required that of every meter-maker. One would think that it was unquestionably the interest equally of the company as of the consumer that the meter should be an accurate meter. I should be very glad if they all felt so, but I should be better able to answer your question if I found the water-line was not above the level. I should think it would be much better for the companies.

Sir W. HAYTER repeated his question, and Sir J. SHELLEY contended that the witness had already answered it.

The CHAIRMAN: It is an argumentative answer. I think he should say, "It is so," or "is not so," and the companies can then give any explanations they please.

Mr. LOCKE: But still there are some questions which you cannot answer by a "yes" or "no," if they involve an expression of opinion.

Sir W. HAYTER (to witness): Is it not to the interest of the companies, unless they desire to defraud, as well as to the interest of the consumers, to have an accurate register?

Witness: That is put in such a way that I do not like to answer it.

Sir JOHN SHELLEY: That is quite right.

Mr. LOCKE: I object to that question altogether—"unless they desire to defraud!"

Witness: I will state this, that I do not believe it is the wish of any gas company to commit a fraud, as a company. As far as they are concerned, I believe it is to their interest to have accurate registration. I conscientiously believe there is not a company—I speak of a company as a board of directors—who knowingly do commit a fraud, or would countenance a fraud if they knew it was committed. I do not, and I wish it to be distinctly understood, complain of any individual company committing a fraud or of being knowingly in any way a party to a fraud, but I say that they use meters which are liable to do so, and they thus place themselves in a position which I think they should not do.

Mr. LOCKE: That is a fair answer.

Sir W. HAYTER: It is an imputation upon the companies.

Mr. LOCKE: No, not at all.

Sir W. HAYTER (to witness): Notwithstanding it is to the interest of the companies to have an accurate register, they do not use your meters?

Witness: I believe there are a great many companies do not know anything at all about them, and also, that many companies do not know of the faults which exist in their meters. I do not say that most of the meters at present supplied are inaccurate at the water-line, but that they are liable to become so if overfilled. I do not wish for any legislative interference to compel the employment of my meters. I am aware that there is an Act of Parliament to determine what the capacity of a cubic foot is, but it does not specially state that it applies to the measurement of gas; and as there is such a difference in the cubic foot of gas in various parts of the country, I think that either the Act is not known or it is not considered to be applicable to gas. I am not sure that further legislation is not required to explain that the existing Act applies to the measurement of gas, and to put it in force.

By Mr. RUSSELL: The standard having been determined by law, there should not be any difference in the capacity of a cubic foot of gas in one place or another. As 1728 cubic inches are a foot, the companies cannot use 1750, or any undefined number, and consider they give a correct foot; but if the Act of Parliament is intended to apply to gas, it is not employed at all places, and I think there should be some means adopted to compel the manufacturers to comply with the law in that respect. As it is, it produces very great awkwardness to gas-meter makers, and I think also to the companies themselves. I am not aware whether in the making of ordinary weights and measures the scale-beam itself is subject to any test, or whether the regularity of its size is determined by the maker without being subjected to any examination. With reference to meters, I believe that some years ago Mr. Frederick Evans, the engineer of the Chartered Company, introduced one upon the principle which I have described, in which the spout was cut to the true level. I am not aware whether it has been very largely in use by several of the companies since that period. I do not claim any novelty in that part of the invention—the application of an overflow-pipe does not form part of our patent—what we claim is the mode of adjusting it to a greater nicety.

Mr. RUSSELL: Then, as far as your meter is concerned, the public had an ample protection before by the invention of the same principle of Mr. Evans?

Witness: Upon that point we have no claim, and I say that Mr. Evans's principle, which I believe was the first, answers the purpose. Our patent is for the compensating part—the screw upon the pipe and the mode of regulating it; by which we can regulate it with greater nicety and greater accuracy. I consider that the benefit of the companies was the great object for which our patent was obtained. I think, as far as the consumers are concerned, meters made upon the principle of cutting the spout to the true water-line, ought to be satisfactory. It is the look out of the companies if they do not properly estimate the protection which our compensating apparatus affords them. I do not consider that by the use of our meters the registration would be greater than the actual consumption; that is, within commercial limits—two per cent either way. By no properly-constructed meter could the companies, who have not the meters in their possession, cause the wheel to revolve without carrying with it its contents of gas? Whatever is in the chamber will go with it, whatever it may be; and for whatever increase the index-point may register, there will be a corresponding increase in the quantity of gas delivered, assuming the meter is correct and the water at its proper level. The meter has nothing to do with the quality of the gas. I remember writing a letter to the Imperial Company on the 9th of September, 1856, in which I used these words—"I feel satisfied that our patent meter will be found to protect the interests of gas companies more than any other yet introduced." That was my opinion, as I have before stated, and the object with which I took out the patent. I believed that the natural tendency of the water-line was to get below its proper level, and I went to that expense to protect the companies; but when I came to introduce my meter, I found the water-line the other way. I have no doubt the companies are willing to protect themselves from being plundered. I think many of them are very clever, and have very clever officers, and I do not know that they require any suggestions from me to protect their interests. I do not know that there was any special object in affixing the number 47,000 to the first meter. I understand it is very frequently done by makers.

Mr. RUSSELL: Do you mean to tell me it is any justification, because one man does an improper act, that you followed him?

Sir J. SHELLEY: Is it an improper act? Prove it. You are assuming it.

Witness: We did not begin with that number; but I cannot answer the question because I have not my books here. We began business in 1855. I cannot say how many meters we made in that year.

Sir B. HALL and Sir J. SHELLEY protested against the question being urged, the former stating that he thought it was contrary to practice to ask a witness how many articles he sent out of his shop or manufactory in the course of a year.

The CHAIRMAN differed from the honourable members, and considered the question of how many thousands of meters were sent out in the year a very general one.

Sir J. SHELLEY urged that the witness had a right to put any number he chose upon his meters, and that the object was, as stated, for a reference in his books.

The CHAIRMAN said the object was so patent that he did not consider it necessary to pursue the inquiry further.

Sir B. HALL said it was a very common thing in some trades to affix a high number to the article sold.

Mr. LOCKE: It is his private mark.

Mr. RUSSELL: The charge has been brought against the companies in rather a dead way, by a witness who was examined on a former occasion, that by some means or other, as he conceived, they added the vapour of water to increase the measurement of the gas. Can that be done?

Witness: I would rather not answer that question, as I consider myself particularly a mechanic.

Sir B. HALL: And he is not responsible for what they are able to do.

Mr. RUSSELL: No; but he is connected with gas, and he can give us an opinion whether such a fraud as this can be practised.

Witness: I do not clearly understand your question.

Mr. RUSSELL: The charge was made that, the quality of the gas having been tested at the company's works, the body of it was increased afterwards by the vapour of water or some other cheaper material than gas, in order to make it register more than it ought to do?

Witness: Candidly, I think it is scarcely a question applicable to me.

The CHAIRMAN: Do you feel yourself incompetent to answer it?

Witness: As a mechanic, I tell you that the meter will register, if correctly adjusted, the quantity of gas that passes through it, be it composed of what it may.

Mr. RUSSELL: But that is not the question I put. It is whether, by mixing up a quantity of watery vapour with the gas, they can make the meter register more than it would do if it were pure gas?

Sir J. SHELLEY: He cannot answer you. It requires a chemist for that.

Mr. RUSSELL: If he says he cannot answer, that is enough.

Sir J. SHELLEY: He has said so over and over again.

Examination resumed: I am not aware that a 3-light meter upon my patent principle, which has been used by the Chartered Company, is now in the employment of the London, nor of the fact that the water having stood below the centre opening, the gas has passed through the wheel without registration.

By Sir B. HALL: In my last examination I said that the Liverpool measure is greater than the Manchester, and that, as I understood it, the Liverpool measure is according to the measure prescribed by the Act of Parliament. I believe that the gasholders are different. I do not say that there is a cubic foot in one place and not in another, but that what professes to be a cubic foot in one town does not agree with what is given in another. What I mean is this—if you professedly get a cubic foot in Liverpool and also in Manchester, I think, though the actual cubic foot should be the same in each, you get more gas in one town than in the other. I cannot give the committee any information in relation to the quantities given by the different companies in London, or whether they all correspond. I am not so practically acquainted with the testing apparatus in London; I can only speak generally that I have understood there is a difference, but I can give no information on the point by comparison. The meter which I sent to the London Gas Company was, I believe, a glazed one. Meters are not usually glazed; those which are, are for show models or for temporary experiments, and they might work for a few days or a week, or something of that kind. That one was sent with a glazed front for the purpose of showing the interior arrangements of that kind of meter. With reference to the meter now produced, there are three water-lines—the first very clearly defined, the second not so much so, and the third scarcely perceptible. The two first show that the level at which the water ordinarily stood was so much above the true level as to ensure a much larger charge to the consumer than should have been made for the quantity of gas passing through the meter. From the indications exhibited the committee may suppose that the water was more frequently above the proper level than below it, inasmuch as the water-line below the proper level is very faint indeed, and that the consumer would necessarily be charged for more gas than he consumed. If there had been an overflow-pipe at the proper level, it could not have been surcharged. I still remain of opinion, as expressed in my former examination, that it is very desirable there should be some legislation upon the subject, and that the consumer should be protected by having an inspector of meters appointed. When the water gets below the level in the meter, the company is not damnified in the same proportion that the consumer is when it is above the level, because the measuring-wheel is immersed in water to a certain depth above its axis when in its proper state; but when the water is filled above, in consequence of the shape of the case, which gets narrower, and the wheel also, the same quantity of water poured in at one level will fill up much quicker than at another, and would affect the chamber to a greater depth.

Sir B. HALL: Then supposing there was an overflow-pipe at the top of the level at which the water should stand, the interests of the manufacturer and the consumer would be equalized. If any evaporation takes place is it not very possible to have some arrangement, either by a float in the nature of a ball-cock, or otherwise, so as to secure the company against any loss by keeping the reservoir over-filled?

Witness: They have a float in the meter already, and with that object to a certain extent. When the meter is properly filled, the float probably will be in that position (describing on meter), and thus keeps the valve open. If the water gets lower the float descends with it, and ultimately closes when the water descends to this level. That is a protection to the companies to that extent. It is what is called the range of the float. When the valve is closed the gas is shut off, and the consumer can get no more light.

Sir JOHN SHELLEY: Now, Mr. Crosley, you have been subjected to a considerable cross-examination with reference to meters, and you have been asked what induced you to come here. Did I understand that you come here in the interest of the consumer, believing the meters generally in use in London and elsewhere are not likely to do justice as between the suppliers and the consumers of gas?

Witness: I really came here to state facts. I have found some meters not in the state they ought to be.

Sir JOHN SHELLEY: I think you explained that there were high-spouted and low-spouted meters in use. Have some of the low-spouted meters been made into high ones?

Witness: I merely state as a rumour that I have heard of six of mine being so transformed. The high-spouted meter is in favour of the company, because it enables them to fill the water up to a greater height than it should be, and by that means reduce the measuring capacity of the wheel. The fitter puts the water into the meter in the first instance; he is employed in London by the consumer generally, but the inspector of the company attends

to the meter after it is fixed. I do not know how far the company can prevent the consumers from tampering with their meter, in some cases and with some meters, after the inspector's back is turned; that is, if they understand them. My objection to the syphon above the plug or water-line is, that in that state it will cause the meter to register against the consumer. I cannot give the committee any opinion as to the number of meters of that vicious description in use as compared with others. It would be mere guess-work, as I never heard of a return being made. I believe there are a great many more high-spouted meters in use in London than the others. I should say that the range of error in a 3-light meter would be greater than in a 10-light meter; so that, supposing the error to be against the consumer, it would apply more to the small than to the large consumer. The small consumers are not necessarily those of the poorer classes. In many places there still exists a prejudice against gas, and persons will only admit it into their hall and no further. Very rarely, indeed, a poor person uses a meter so large as a 10-light, and the proportion of small meters is much greater than of large ones. Mr. Evans, of the Chartered Gas Company, has not introduced a new meter that I know of, but he has introduced an overflow-pipe with a waste pipe below and a seal cup. I understand Mr. Thomas Edge manufactures that meter, but I should say that, by comparison, the number of them in use in London is very small.

Sir JOHN SHELLEY: I think I understood you to say that you thought there should be some meter such as in other measures, stamped and certified by a competent authority, which should be in general use. Do you think that any enactment that forces upon the company a fixed meter, stamped and certified as correct between the producer and the consumer, would have a good effect?

Witness: I do not wish to fix upon any particular meter, but I think there should be some arrangement by which the consumer should be able to know when he has got a correct one and one that can be relied on. It has been found necessary before to have them certified by a competent authority. The question has been raised in various towns, and, moreover, I believe that on the other side of the river there has been some attempt at it. As far as my opinion is concerned I say that that has not gone far enough, though it is very good as far as it goes. I must leave to others to decide whether those meters which are most liable to be tampered with should be put on one side, and not permitted to be used. It would be an advantage undoubtedly. As previously stated, I believe the companies, as companies, are entirely innocent of any intention to defraud the public. I believe they do not know of these liabilities to error, and I think that this is one way of drawing their attention to the subject. In a pecuniary sense it may be more to the interest of the companies to have meters in use which register more gas than is actually consumed; and my answer to the question on this point, which was previously put to me, depends very much upon the way in which that question is put. I have heard that a petition has been presented by a Mr. Romfitt to this committee, praying that an official should be appointed under Government authority to inspect the meters of the metropolis, and I think that, if Parliament should interfere in this matter, there should be a registration-office for meters, so as to ensure justice being done between the producers and the consumers of gas, and that no meter should be used which has not been stamped by the proper authority. At the present time the system is adopted in France, I believe, but in this metropolis the companies can use any meter they like, although it may be liable to become unfair to the consumer, unless he resists; and there is no competent authority to whom he can refer. The testing of meters is not general in London; the arrangement for so doing is only local. I think if some means for testing them were enforced, it would be a satisfaction to the companies, the consumers, and the gas-meter makers as well; every conscientious person would wish it. The return put in by me of experiments made in Manchester shows that, supposing the same class of meters are in use in London, the same variations in registry may, and probably does occur; but I am not so well acquainted with the meters in use in London as to be able to say whether they exist to the same extent. It is a fact that the only two meters I have examined in London by taking off the points I have found in that state.

By Mr. BARROW: In my meter the deficiency of water by evaporation is provided for by the reservoir. In the ordinary meter, the method by which the consumer can ascertain whether his meter is filled to the proper level or not is by a side-plug. If the plug is perfectly free when it is opened, the water, if above the proper level, will run out of it. When ascertaining it he ought first of all to turn off the gas, so as to prevent any pressure from the inlet. If he then take out the plug underneath and that at the side, he will observe a few drops of water at the side, supposing the water is at the proper level. If it is overcharged the water will flow out in a stream proportioned to the height of the overcharge; if it is below the water-line he will not observe any. He can do this at any time with perfect convenience, but there are very few consumers who understand it. If the experiment is attempted with some meters—those without the hydraulic, while the pressure is on—the water will be blown out, although below the water-line. The person who fills the ordinary high-spouted meter does not refer in any way to the spout to ascertain whether the water is at the correct line; he has to do only with the side regulation—the plug; that is his only guide. If the plug is left out and the meter properly vented, he cannot overcharge it with water. There is an inconvenience in leaving the plug out under ordinary circumstances, because immediately the gas is turned on the pressure of the gas would drive the water out; very likely produce danger in some meters. It would thus reduce the water again below the proper line, and in all probability put the lights out in others. It would not be desirable that the meters should be kept under double lock and key, so that neither party could get to them, because of the possibility of accident from leakage requiring immediate attention. My own impression is, that the meter, generally speaking, is not treated with sufficient respect. I think it should be treated as a clock; but, instead of that, we frequently find it in the coal cellar, or some out-of-the-way place. This may have some effect upon the evaporation during the three months from the time they are inspected. I have been told that meters are liable to become overcharged by condensation, but that is a question I decline giving an opinion upon. If such be the case, however, it is an additional reason why there should be short spouts instead of high ones. The short spouts would be subject to the effect of pressure, but not in the same way as the ordinary side-piece, because the pressure would be uniform over the surface of the water, and would not cause it to overflow. Whatever water there was in excess would go into the lower chamber. The inspector takes the index of the meter once a quarter generally, but in some places more frequently—once in six weeks. Whether the evaporation during the interval would be sufficient to affect the registration would depend on circumstances. If, for instance, the meter were placed in a baker's shop, evaporation would go on much quicker than if placed in a coal cellar. I have no doubt about the superiority of wet over dry meters, when the proper water-line is maintained. It depends upon the construction whether the reservoirs could be tampered with. We make them of various degrees of perfection, according to the price we get for them. We have made meters which could not be tampered with at all. In the ordinary meters, and in some patent ones—those which have not the "anti-tilting" apparatus in them—"tilting" would make a difference. Those which have all the perfections in them will not bear it without putting the lights out. The expense of these is greater than others. I cannot say how much more they would cost, but not cent. per cent.; so that if the consumer had a meter on hire of the best possible construction he would not pay more than double his present rental for the use of it. I have furnished meters to both Manchester and Liverpool, but only to a small extent to the former. The meters to both would register precisely the same cubic foot of gas as regards the supply from London, but it does not follow that when they got to Manchester and Liverpool the same report would be made upon them. For instance, I believe a meter pronounced to be correct by the Liverpool Gas Company, and also by the corporation tester there, would not agree with the gasholder or the testing apparatus at Manchester. The question is, which measure is right? If Liverpool is right, and Manchester does not agree with it, Manchester cannot be right.

Mr. BARROW: You do not mean to say that gas of different qualities will produce a difference in registration?

Witness: No. I think the registration has nothing to do with the quality of the gas.

By Mr. MILLS: We have supplied meters which are not on our patent. We manufactured meters before we obtained a patent. The reason some consumers do not take our patent meters is because of the difference in price. That difference depends upon the size, and is about 10 per cent. in excess of the ordinary charge on large meters, and 20 per cent. on small ones. We do not deal much with individual consumers, but principally with companies. There are meters which are as nearly perfection as possible and less liable to be tampered with than others, except by violence; but you cannot prevent a consumer using a chisel and destroying the case.

By Sir W. DUNBAR: I have stated that the meters, in a great variety of cases, are capable of being made to register inaccurately, and that they do so in fact. The alteration in the registering power may be made to tell either for or against the companies. I believe, however, upon the average, that in the greater number of instances they register against the consumer. At the time my patent was obtained to protect the interests of the company I might have known that there were cases which told the other way; and, having tested many meters since, I confess I am surprised to find that they are so numerous. Our meters do not offer greater protection to consumers than all others which have an overflow-pipe, of which there are plenty.

By Mr. BYNG: If the consumer does not understand the working of the high-spouted meter he has no protection against being wronged, except in the integrity of the person who supplies it with water. I have supplied my patent meters to many provincial towns and I have reason to believe they are satisfactory. The best proof of that is that I have altered many hundreds of high-spout meters to low.

By the CHAIRMAN: The water in the meter being above the proper water-line does not diminish the light until it gets to such a height that the wheel becomes water-logged, and it must get to a great height for that. I have no idea of the number of meters in use in London. As a general rule, all consumers are supplied with a meter at the present time. I believe by far the greater proportion are wet meters. It depends upon the district, however, as some companies supply more dry meters. Instances given by one company, therefore, would show nothing as regards the general rule in the metropolis.

By Sir W. HATTER: I believe the Imperial Company allow their consumers to select from a certain number of manufacturers. I should not be surprised to hear that, since January in this year, at one station only of that company, 1058 dry meters and but 20 wet ones have been tested by them. To use a common expression, they are called "The Imperial Dry Company." I do not know, but I believe the consumer is at liberty to choose either a wet or a dry one. I certainly made my own selection, and chose a wet one.

By Mr. RUSSELL: I am aware that at No. 82, Westbourne Terrace, since the consumer has had one of Smith's meters, the consumption has risen from 22,800 to 30,600 feet. The answer to that is, that a year and a half ago a very faithful servant of hers, who had been used to look after the accounts, died. Before then the servants had been obliged to economize the gas, and since then they have been more reckless. In addition to that she has had several more burners added; and in the next place she has recently given two hours' instruction to her pupils in the evening by gas-light, which she had never done before. From these causes the consumption has increased.

By Sir J. SHELLEY: At Liverpool there is a corporation tester of meters, so that the consumers have a remedy against inaccuracy in their meters; they have also a remedy in the meters themselves, which have overflow-pipes. I think that as regards the metropolis it would be an advantage to the great body of the inhabitants to have an authorized inspector of meters. There is no independent inspector in Manchester, the gas there being supplied by the corporation itself.

By the CHAIRMAN: I have heard that persons have gone round some of the districts in London to educate certain consumers into the way of defrauding the companies of their gas. I have only heard of it as a rumour, and not within the last two years.

By Mr. BYNG: I do not know of a single case in which it has been done.

By the CHAIRMAN: I have heard of tilting meters, but I never knew of an individual case. It can be done with some meters. I have never known an instance of a "jerry" being used. I do not know what it is.

Mr. *Slee* called, and examined by Mr. LOCKE.

I reside in Russell Street, Bermondsey, and have lived in Southwark for twenty-five years. I produce a statement of my consumption of gas from 1850 to December, 1857. [Paper handed in.] I have been churchwarden of the parish. Until the districting arrangements we were supplied by the South Metropolitan Company, but since then by the Surrey Consumers' Company. The gas consumed in the church in the year 1852-3 amounted to £6. 12s. 9d.; in 1855-6 to £8. 3s. 9d.; and in 1856-7 to £8. 5s. 3d. There were no additional burners used in the latter years, and the services held at the church were the same. In my business premises in 1850 I was supplied by the South Metropolitan Company, and my consumption amounted to £41. 4s. 10d.; in 1857, when supplied by the Surrey Consumers' Company, it was £72. 4s. 6d.

(To be continued.)

Legal Intelligence.

COURT OF COMMON PLEAS.

GUILDHALL, JULY 1.

(*Sittings at Nisi Prius, before Lord Chief Justice* COCKBURN *and a Special Jury.*)

BEDDING *v.* THE IMPERIAL GASLIGHT AND COKE COMPANY.

Mr. HUDDLESTON and Mr. TOMPSON CHITTY appeared for the plaintiff, and Mr. J. WILDE and Mr. C. POLLOCK for the defendants.

This was an action to recover damages for loss occasioned to the plaintiff in his business of a publican by the defendants refusing for an unreasonable time to supply the plaintiff with gas.

It appeared that the plaintiff became the occupier of the Penton Arms Tavern, Claremont Terrace, Pentonville, on the 16th of May, 1857, it being then a shut-up house. It appeared that the former occupier, Wetherall, was in arrear for gas £20. 5*s*., and the defendants had cut off the gas. A person named Motion took an assignment of the lease from Meux and Co., the brewers, Wetherall paying off Meux and Co.'s lien, but refusing to take any liabilities beyond that, and Motion assigned the lease to the plaintiff. About the 19th of May the first application was made to the company to supply the plaintiff's premises with gas, and on the 30th Motion referred the company to Walter and Pemberton, the solicitors, stating that he never took any liability for the gas arrears when the lease was transferred. Meux and Co. and Wetherall had sent letters to the company, leading them to believe that Motion had taken the liability for those arrears. There were subsequent interviews with officers of the company, and requisitions to lay on the gas. The plaintiff's solicitor wrote to the company on the 27th of May making a requisition, but no notice was taken of this until the 5th of June, and on the 9th of June issued the writ in this action. The gas was laid on on the 13th of June. The plaintiff had announced the Penton Arms to be reopened for business on the 30th of May, and had laid in a stock of porter, ales, &c. In consequence of the company delaying to supply the gas, the plaintiff had lost the anticipated profits of Whitsun-week and the following week, besides the quality of his articles having become deteriorated, and his being obliged to return ale and porter as waste to the brewers.

Evidence was given on the part of the defendants to show that they had acted with reasonable despatch in investigating whether the plaintiff had undertaken to pay the arrears of gas due from Wetherall, and to show that they *bonâ fide* believed there was such an undertaking.

For the defence it was contended that there was no obligation on the company to lay on the gas the next day after a requisition, and that they were entitled to a reasonable time for investigating the matter, especially after the letters of Meux and Co. and Wetherall.

The following section (15) of the Imperial Gas Company's Act, 1854, is the one applicable in the present case:—

> In case any consumer of the gas of the company shall leave the premises where such gas has been supplied to him without paying the company for the gas so supplied, the company shall not be entitled to require from the next tenant the payment for the gas left unpaid for by the former tenant, unless such in-coming tenant shall have undertaken with the former tenant to pay or exonerate him from the payment of such arrears for gas, but the said company shall supply their gas to such in-coming tenant, upon the usual terms and conditions, upon being required by him so to do.

The learned JUDGE, in summing up, told the jury that if the section cast an obligation on the company to supply an in-coming tenant with gas, unless they could show that there was an agreement on his part to pay the arrears for gas, then, inasmuch as no such agreement was shown, the company were without a defence. But, he said, the section was capable of another construction, that if the circumstances were such as led the company to believe *bonâ fide* that there was such an agreement, then they might be entitled to a reasonable time to ascertain how the fact stood. He should reserve for the opinion of the court which was the right construction, and he should leave to them these two questions of fact:—First, did the company act *bonâ fide* under the belief that there was such an agreement? and, secondly, had the company taken more than reasonable time to investigate whether or not there was such an agreement?

The jury found that the company had good reason at first to believe that there was an agreement between the in-coming and out-going tenant for the former to pay the arrears, but that they took an unreasonable time to satisfy themselves of the fact.

The damages were assessed at £25.

Miscellaneous News.

METROPOLITAN BOARD OF WORKS.

STATE OF THE THAMES.

A Special Meeting of this Board was held at the Guildhall on Tuesday, the 29th of June, at twelve o'clock, for the purpose of taking into consideration certain motions with reference to the condition of the river. Mr. THWAITES presided.

The CHAIRMAN said he had received, a few days ago, a communication from the First Commissioner of Her Majesty's Works, asking for information respecting the Victoria-Street sewer, and he gave the information required. He had directed the engineer to apply lime to that sewer, having regard to the health of the public as well as of the members of the Houses of Parliament. (Hear, hear.) On Saturday he had an interview with the First Commissioner on matters connected with that board, and respecting the state of the Thames. In speaking on the main principle to be adopted in relieving the Thames from pollution, the conversation turned on the immediate remedies to be applied to abate the present nuisance, and it was suggested that if lime were applied to the mouths of each of the sewers, that would tend to abate it. All he could say was that he believed that board would do its duty. (Hear, hear.) The cost, however, was a heavy item, and he doubted whether they had power under the Metropolis Local Management Act to apply money for that purpose. On Monday morning he received a letter, signed Alfred Austin, by direction of the First Commissioner, which urged the adoption of such temporary means as might be deemed advisable to check the nuisance from the river, and promised the introduction by the Government of a bill to enable the board to charge the rates of the metropolis with that expenditure. (Murmurs.) The letter also suggested the preparation by the board of a draft bill for that purpose. The matter was now in the hands of the board, to adopt such measures as they might think proper, and also to sanction the step which he had taken in directing lime to be applied to the Victoria-Street sewer. He had had several conversations with the engineer of the board on the matter, so that he might be able to give any information that might be required. From a report which had been prepared on the adoption of immediate temporary means for the deodorization of the metropolitan sewers, it appeared that there were 64 main outlets under control of the board, and 96 under local bodies; the great bulk of the discharge was from 40 main sewers, and the cost of deodorizing those 40 sewers would be about £150 per day.

Mr. DOULTON expressed his surprise at the communication which had been made on the part of the First Commissioner of Works. If he understood it aright, they were simply to be allowed to do what they liked with the rates of the metropolis. The question was one which would demand great consideration before they should commit themselves to an expenditure of £1000 or £1500 a week to be raised from the rates of the metropolis. He was in the committee-room of the House of Commons yesterday, and he had heard the First Commissioner say that he had given the Metropolitan Board *carte blanche* to spend the money; but if they had not power before to spend the money raised out of the rates, they were in a very miserable condition. (Hear, hear.)

Mr. NICHOLAY said that a very great evil was threatening the City, and he felt thankful to their chairman for having come before the public and shown that they were anxious to do everything in their power to prevent it. The chairman had ventured to do things on his own responsibility which he hoped would be unanimously approved by the board, and with that view he had a resolution to submit which would at once show the public that they were anxious to do their duty. Mr. Nicholay then proposed a resolution, which was to the effect that the board approved of the steps which the chairman had taken with regard to the Westminster sewer, and conferred on him power to act in such a way for the future as he might think advisable to arrest the evil in question.

Mr. BIDGOOD seconded the resolution, and in doing so expressed a hope that there would be an unanimity about their proceedings that day which would reassure the public, and show that they were intent on doing the great work which had devolved upon them. He begged to call attention to the last week's return of the Registrar-General. From the reports in the newspapers, and from what had been said by learned judges, magistrates, and others, one would have thought that London was by this time half poisoned; but the returns of the Registrar-General showed a very different state of things. There are two classes of disease in which the public feel a great interest at the present time—diarrhœa and typhus; but along the river there were hardly any deaths at all from those diseases, while in Camberwell and Kennington, and other badly-drained places, there were several. Though he quite concurred in the motion which had been proposed, and approved of what had been done by the worthy chairman, he thought it right to mention those facts; at the same time he admitted that the disgusting state of the Thames was very prejudicial to health. He had to go daily up and down the river, and he believed that the handkerchief applied to the nose was as good a remedy as could be adopted, and a few yards from the river even that was not necessary. If the public would turn to authorized documents, they would see that their fears were perfectly groundless. They might trace the Thames from Rotherhithe and Greenwich to Charing Cross, and no deaths would they find from typhus or diarrhœa along its banks.

Mr. H. LOWMAN TAYLOR thought that the honourable member was not quite aware of the nature of the resolution which he seconded, as he said there was no fear, and yet would sanction a course which entailed a heavy expenditure. He (Mr. Taylor) thought that the chairman had acted judiciously in authorizing a certain work to be done up to the present time, but he quite disagreed with the proposition that any one member of the board, whether chairman or otherwise, should be invested with a power which the board ought to hold in its own hands—that of expending a large sum of money. He objected to that course, and hoped the honourable member would not press the whole of his motion, but would consent to omit that part which would authorize the chairman to undertake any future outlay.

Mr. NICHOLAY approved of the suggestion.

The following resolution was then put and carried unanimously:—

> That this board approve the steps already taken by the chairman for the application of lime to the Westminster-Bridge sewer.

Mr. NICHOLAY then moved—

> That in the present offensive condition of the Thames the chairman should have full power to take such steps as he may deem necessary for the deodorization of the contents of the principal sewers, and to report the cost from time to time.

Mr. D'IFFANGER said he did not consider the chairman merely as one of the members of the board, but holding a far more responsible position. He had the strongest confidence in the chairman, who had never on any occasion gone beyond his powers, and he should therefore second the resolution.

Alderman CUBITT presumed that if the chairman were requested to undertake that duty he would be advised by the engineer in every case. He wished to know whether the lime was placed at the mouth of the sewer by the advice of the engineer, for that would destroy the fish?

The CHAIRMAN: The principal process was to put the lime into the sewers.

Alderman CUBITT said he was told that the best way of introducing the lime was to slack it first, to make cream of lime, as it was called, for then it mixed readily with the sewerage water.

Mr. BAZALGETTE said the mixture, in the shape of cream of lime, was much more expensive; and his impression was that it was not necessary at present to go to that expense. The lime, if thrown into the sewers, was very soon dissolved by the water in them. They had found at Westminster, where there was a great rush of water, that it was mixed up at once.

Mr. WRIGHT believed that unless the lime were thoroughly slacked at first it would not slack at all when put into the water.

Mr. Deputy HARRISON said that the resolution they were asked to pass was absolutely to abdicate their functions, and commit them entirely into the hands of the chairman. The chairman had not known until to-day that the weekly expense for deodorizing the sewers would be £1500. If the matter was to be brought before the board, surely the representatives of the public would not think it too much trouble to come together to consider it. He would not support the resolution, because it was saying that there was no necessity for a board at all. He highly approved of what the chairman had already done, and he had the greatest confidence in him, but he would not support such a principle as was contained in the resolution; and if he stood alone he should record his vote against it, because it cut away the very foundation of municipal government.

Colonel KENNEDY said that if the board were not prepared to pass this resolution they must sit day by day. He did not think it was abdicating their functions, nor would he abdicate his, but he wished to do what was rational. In passing that resolution they put the responsibility on the chairman, and it was the only proper way to do an executive work; for so long as a work was left to a board there was no such thing as responsibility—it was impossible to fasten it on any one member. (Hear, hear.)

Mr. DOULTON should vote against the resolution for the very reason that it placed the responsibility on the chairman, where it ought not to rest.

Mr. WILKINSON said it appeared to him that both the honourable deputy and the member for Lambeth took an unfair view of the subject, for they

wished the board to take a course of action which it was impossible for them properly to execute.

Mr. LESLIE said that this was nothing more than a great experiment on the part of the deodorizers—(laughter)—and if successful the functions of the board would cease, and the First Commissioner's recommendations be carried out by Mr. Henry Austen and Dr. Southwood Smith. (Laughter.) What did they know about the stories from Leicester? Some said the plan was most successful, but others that it was the most abominable nuisance that could be. It was quite right to indemnify the chairman, but how long had deodorization been advocated by Mr. Bazalgette and Mr. Bidder? and now they were going to be caught in the trap. If the board resolved to let this experiment go on, the members for the localities in which the process was being carried out should be called on to examine how it worked and report on it. They ought not to give any authority except from week to week, and they ought to ascertain for themselves by ocular demonstration what was being done. £1500 a week was something like £80,000 a year; and, when so large an expenditure was in question, he did not think they should allow any member an unlimited power beyond from one sitting to another.

Mr. PALMER could not support the motion; if it were a question of confidence or no confidence, he would vote for unlimited confidence in the chairman, but he could not consent to anything which would, even by implication, tend to defer the more important question for which they were met to-day.

The CHAIRMAN said he should not regard it as any question of confidence or want of confidence in himself, but with the view of relieving himself from responsibility; if the board passed the resolution, he should feel it his duty to report from week to week what had been done.

Mr. WARE said he should be quite willing, for himself, to place in the chairman's hands the power which it was proposed to do; but he thought the right course, as regarded the board, was to authorize the engineer to act with the consent and concurrence of the chairman, and append to their resolution that the chairman should report to the board at every meeting what had been done.

Mr. ECKETT was of opinion that the board should rather appoint some of its own members to act, and he would suggest that the words, "and a committee of this board, consisting of not less than seven persons," be inserted in the resolution. The expense to be incurred was very large, and what would be thought by their constituents if they were to abdicate their functions? He thought there was great danger of being carried away from their propriety by what had occurred in Parliament during the last few days. He was quite willing to share in the responsibility for the delay in adopting a scheme of drainage; that delay would be found beneficial to the metropolis at large; and, moreover, the Government were as much at fault as the board. There was so much difference of opinion on the subject, that the board would have acted very indiscreetly if they had taken any hasty steps; and perhaps, had they done so, they would find the scheme a failure after an expenditure of several millions, and the incompetency of that board would then go forth through the length and breadth of the land. (Hear, hear.) He would, therefore, propose that the resolution should run thus:—

That during the present offensive condition of the Thames, the chairman and a committee consisting of not less than seven members be appointed, with full powers, &c.

Mr. CARPMAEL seconded that proposition. It was true there was much alarm, and there was good reason for alarm. Something should be done, and he knew of no impromptu remedy but using lime, as far as it could be used effectually, by pouring it in at the mouths of the sewers. It would be unwise of the board to place so large and so unfair a responsibility on the chairman. If the duty was to be done, every member of the board should be ready to do it day by day; and if he was not able to do so, then he should resign, and let another take his place. He hoped whoever would be named on the committee would consider it their duty to give their attendance day by day.

Mr. LESLIE suggested that the committee should consist of eight and the chairman, the gentlemen in favour of the lime process constituting one half, and those who held different views on the subject the other. (Laughter.)

The amendment was then put, and negatived without a division.

Mr. BRISTOW said there was great difficulty in putting that responsibility on the back of the chairman, and great difficulty about confiding the management to a committee; both difficulties would be met if, from week to week, the board instructed its officer, the engineer, under the sanction of the chairman, to do that which the matter required. It would obviate the question what the engineer of that board was doing. There would always be a reluctance to find fault with the chairman; but no such difficulty existed with regard to their officer, who was below them, whereas their chairman was above them, and they would feel a difficulty in altering his arrangements. His motion was—

That, during the ensuing week, the engineer of the board, with the sanction of the chairman, be instructed to proceed with the best practical arrangements for the deodorization of the principal sewers, and report the same at the next meeting of the board.

Mr. WARE had great satisfaction in seconding that resolution.

The resolution was put and carried unanimously.

Mr. WILKINSON moved that the resolution which stood No. 4 on the paper take precedence. It was entitled to do so, as being an adjourned motion from the last meeting, and it was simply a mistake that it had been placed No. 4 on the paper.

The CHAIRMAN said there was no doubt whatever that the business before the meeting was as it appeared on the paper.

Mr. H. L. TAYLOR, in moving the resolution which stood in his name, said that he apprehended that since the 2nd of June sufficient had been shown to every member of the board to convince him that there was an altered state of things with regard to the Thames; and those gentlemen who had, on that occasion, voted for the adjournment of the question until October might have occasion not to reproach themselves by agreeing this day to rescind that resolution in order that they might fairly and fully go into the all-important question of a plan for the drainage of London. (Hear, hear.) He was not going to foreshadow any plan of his own, he only wanted that the board should have a clear stage. They had no power to explain the state of things in the House of Commons, and show that that board, as a representative body, had endeavoured to do its duty; they had been most unjustly reproached, and that was the only place where they could defend themselves or give vent to their feelings. That board was for progress. (Hear, hear.) They were warned, and seriously warned, that the present state of things ought not to continue; and if they were resolved to do their duty, it was for them now to enter upon the most important question that was ever confided to any public body. He felt encouraged, especially now that they had a gentleman whom they should have the privilege to lay their plans before who would treat the board with respect, with consideration, and would take care not to offer the least insult to a public body—he referred to Lord John Manners. In him they had a gentleman who was capable of comprehending his duty, while the man whom he succeeded, the liberal member for Marylebone—(cheers, murmurs, and laughter)—had always, from first to last, offered every impediment to the carrying out of the main drainage of London. ("Hear, hear," and murmurs.) He should move—

That the resolution of the board of the 2nd of June, instant, adjourning the debate as to the adoption of so much of the report of Messrs. Bidder, Hawksley, and Bazalgette as relates to the high and middle-level sewers on the north side of the Thames, and so far as it relates to the high and low-level sewers on the south side, until the first Wednesday in October next, be rescinded.

Mr. SAVAGE said, as he was the mover of the adjournment of the debate till the first Wednesday in October, he thought it would come better from him to second the resolution, fully concurring as he did in the altered state of circumstances. Under those circumstances, he thought they ought, without any delay, to go into the momentous question which was now engrossing the attention of London, and of the greater part of the provinces too.

The resolution was put and carried unanimously.

Mr. LESLIE said he intended to solicit the very serious attention of that board to the statements he was about to make; if true, he expected he should have a very large majority voting with him; if not true, he hoped the gentlemen who thought so would give their reasons for so thinking, and he should receive them with the most respectful attention. He particularly requested the attention of the members of the Surrey side. The metropolis on the south side extended over 45,542 acres, and the report of the gentlemen in question dealt only with 26,720 acres. It was proposed by those gentlemen that there was to be a high-level sewer gravitating towards the river, and draining a space of 26,720 acres: the report omitted 19,000.

The CHAIRMAN: Where are the 19,000 acres?

Mr. LESLIE: I want to know where they are. The total that Mr. Bazalgette's report attempted to deal with was 26,720, while the orders of the board were to deal with 45,542 acres, and not with any part of them. Now, all the rain that falls on the low-level line, being, according to that report, an extent of 14,080 acres, was to be pumped up at Deptford into the high-level sewer; and all that was to be pumped again, at a distance of 7 miles 800 feet, into what he should call the cesspool; so that the rain which fell at Putney, for example, was to be pumped twice. The rain that falls at the south side of the river was to be pumped first into the high-level sewer; it was then to proceed down the river to the proposed outlet, where it was to be pumped again into the cesspool. The low-level drainage of Woolwich and Greenwich was to be brought back to Deptford, and to be pumped twice. According to the calculations of those gentlemen, the quantity of rain which would fall over the metropolitan area, even without taking the sewerage into account, would require a cesspool of upwards of 57 feet deep. If he had stated the facts correctly, he looked upon the whole scheme as one of the greatest engineering blunders that any one could make. The report asserted that the discoloration of the water was not due to the presence of sewerage matter, but chiefly to the presence of inorganic substances brought down and washed up by the tide, and that the condition of the flowing water in the river was not injurious to health. The proceedings of that board to-day, and of both Houses of Parliament, told a very different story from that report; and if the foundations were erroneous, the superstructure must fall to the ground. Then it was proposed that on both sides of the river their system should carry off in six hours 79,900,000 cubic feet of matter, and there were to be two cesspools—one on the north side, about twelve acres in extent, and one on the south of about seven acres. Now, he asked what was to be the depth of those two cesspools to hold this stuff? He answered that they must be 96 feet deep to hold the quantity stated by the gentlemen themselves. But those who were not acquainted with large works could not form a notion of what 79,900,000 cubic feet were. If put into a 10-feet diameter sewer it should be 192 miles long to hold that quantity of matter—192 miles, omitting a fraction, was to represent the quantity of sewerage all to be shot into the Thames in two hours and a half—somewhere about a mile of this stuff a minute. Were they to commit themselves to the adoption of a report which contained such absurdities? The northern cesspool commenced at the North London Dock Railway, and proceeded 5¾ miles to Barking. His opinion had been long expressed that they had no business on the east side of the river Lea. An Act of Parliament showed that another commission was at work there, and they had better leave that commission to do its work than to meddle with it. The General Board of Health was also at work there, and he could not see anything short of infatuation in making that board go through those 5¾ miles of work. When they, the sanitary reformers, had been so long trying in every way to get rid of cesspools, were they now about to establish two enormous cesspools? and, if they did, were they to suppose that Parliament would ever sanction so great a nuisance? An honourable member remarked that the starting-point was at Clapton Common; that was 93 feet above high-water mark; Victoria Park was 37 feet; and South Hackney, 38 feet 6 inches above high-water mark. Well, they were to begin to pump water for 93 feet above high-water level, because those gentlemen chose to call it a high-level sewer, into a low-level sewer, and then to pump it up 37 feet, and the water was to be kept ten hours in the sewers. The more he looked into that wretched thing the more did he see that the board was absolutely imposed upon. Those gentlemen must have imposed upon themselves to imagine that that board could go before Parliament with such a scheme as that. They were told that those works could be carried out for £2,300,000: it was absurd to think of it, for it was not the drainage of the metropolis alone that they were to carry out, but they were to drain the rivers by means of vertical walls—but the Clyde was the best answer to that. The statements which he had made he was prepared to maintain elsewhere. It remained for him now to propose—

That the board reject the report of Messrs. Bidder, Hawksley, and Bazalgette, on account of the engineering absurdities it proposes.

The motion not being seconded fell to the ground.

Mr. WRIGHT, in submitting the motion which stood on the paper in his name, said the problem which had been given to their engineer to decide was a complex one, and almost every man they met with had a plan of his own. Whatever plan was adopted, whether to deodorize the mouths of the sewers or not, the necessity, at all events, was, that the Thames be not polluted so as to offend anybody. When the plan of their engineer had been laid before the First Commissioner, he sent it for examination to two or three other eminent engineers, and if they took exception to it it was no wonder, because it could not be expected that men who had spent the whole of their professional career in a peculiar kind of hydraulic engineering should be able to criticize the plan of an engineer who had a much larger amount of hydraulic experience. They could find fault with the plan submitted to them, but the moment they attempted to propose a plan of their own it was received with a shout of derision. Gentlemen ought to take a lesson from that, but there were some men who were beyond the power of criticism. Well, the board appealed from the adverse opinion to two gentlemen who were well known all over the continent of Europe, and said to them, "Give an opinion on what our officer has done—tell us is it the proper scheme?" and an answer came back approving of it. They had gone to the very persons who were most capable of

giving the best advice, and if their opinion did not coincide with that of certain gentlemen they were not on that account to reject it. When a man was sick he sent for a physician, and though he may prescribe arsenic, you do not argue with him about it, but leave your life in his hands; and so in the present case they should leave the remedy to their engineer. If every member of that board set themselves to gauge the capacity of their officer, and to criticize any particular scheme for purifying their sewers, was it not plain that he would be going out of his sphere? In his opinion, however, the scheme of Mr. Bazalgette was a simple one; it was a complex matter which they gave him to do, but he must say that the general principles on which that gentleman had proceeded were themselves simple, and within the range and comprehension of every member of that board. They had certain high lands about London, and what they were to do was to take away the water thence by gravitation, to take away the water of the next high lands by gravitation also, and so on, and then put the whole out of London at a particular point. The engineer had pledged his reputation on the scheme. His duty that day would have been simply to move that the plans of their engineer, ratified as they were by two eminent engineers, should be adopted; but certain alternatives having been admitted, it was necessary to take them into account. The first part of his resolution was, that the plans with the alternatives be adopted; and in connexion with this there was something which he should wish to explain. There was a certain part of the sewerage of London called the western area, some 14 or 15 miles from the point at which the outfalls of the general plan were put. With respect to this area two plans were proposed, either to carry the whole sewerage some 15 miles down to the general reservoir, or to deodorize it at the mouth of the sewers. For his own part, he accepted the latter solution of the difficulty, because the sewerage in question was very diluted, and it would cost an enormous deal more money to carry it down to the general reservoir. The engineers had reported that the Thames embankment would facilitate the construction of a low-level sewer, and would be the best plan for carrying out the object in view; and it would be madness for the board to send in a plan to Government in which the line of sewer was not the best after all. Seeing that it was better to pass the low-level sewer on the north side only, let them go in conjunction with the Government and construct the sewer, and let the Government and the board each pay that proportion of the cost which would be fair. The next question was, what was to be done with the sewerage, and that was not yet determined. Opinions were very much divided, but the preponderating one was, he believed, that it was valueless, or nearly so. After they had taken the sewerage down to the points recommended, it was not clear that in the course of some years Gravesend and Greenwich would not say, "You have purified London, it is not just that you should send your sewerage to us;" and therefore he thought they should leave that an open question to be determined afterwards. If the sewerage was taken to the points named in the report, it might afterwards be taken to Sea Reach, or some other point which might be desirable—at all events they would have carried it so far on the right road. He should have thought his resolutions incomplete if the attention of Her Majesty's Chief Commissioner was not drawn to the means which would be required for carrying out those works. Some members of that board held that it would be impossible to execute the works unless they were assisted by money from the Government, and in that opinion he concurred. (Hear, hear.) It was difficult to draw up resolutions which should suit the taste and feelings of all; but the business of a board like that could not be carried on unless there was some unanimity among them. (Hear, hear.) Every individual there represented a large community, and if they were to spend three or five millions of money, it was well that they should consider it seriously. But, on the other hand, the lives of their constituents, which were far more valuable than their property, was left in their hands; and, let a man be possessed of what wealth he may, a bed of sickness destroyed the pleasure of the whole. Although, then, they had a money value in one scale, they had something much more valuable in the other. (Hear, hear.) It was not enough to say that the eyes of the metropolis were fixed on that board to-day—the deliberations of the Imperial Parliament were disturbed by their proceedings. (Applause.) There was another responsibility still upon them. That board had been created for the purpose of seeing whether local self-government would act or not; the solution of that question was in their own hands. He begged to move the resolution—

That the engineer having prepared a plan and estimate for the main drainage, in accordance with the recommendations in the report of Messrs. Bidder, Hawksley, and Bazalgette, which plan contains several alternatives, that the plan with the alternatives following be adopted:—1. The engineers having given the board the option of two schemes for the western district—first, carrying the western sewerage into the general intercepting system; and, second, deodorizing the western sewerage at its junction with the Thames,—that the last alternative be adopted. 2. The engineers having recommended that the low-level sewer upon the north side should be carried in a Thames embankment between Westminster and London Bridges, to avoid the settlement of any damage to property in the Strand, Fleet Street, &c.,—that the board is willing to pay for such part of a Thames embankment so required, in such proportion as the drainage scheme may be fairly debited with, or to undertake the construction of the embankment of such part of the river for drainage and other purposes, upon a contribution being given by Government. 3. That the delivery of the sewerage at the points named shall not be deemed a final measure; but, when the main drainage is completed, the sewerage shall be delivered into the Thames direct, or deodorized before delivery, or used for irrigation and sewerage manure, as experience may determine. 4. That this plan and estimate be submitted to Her Majesty's Chief Commissioner for approval, by the chairman, six members of the board, engineer, and clerk, and that his attention be at the same time directed to the letter of this board of the 17th day of January, 1857, to Her Majesty's then Chancellor of the Exchequer, setting forth grounds justifying the expectation that the Government will be prepared to assist the board in obtaining the command of the funds required for their operations.

Mr. CARPMAEL seconded it.

Mr. Alderman CUBITT said he had been on the committee of inquiry into the state of the Thames, and had been up and down the river, and had collected information, and the result was that they should never think of turning the sewerage into the river without being deodorized. If so, why carry it to Sea Reach or Barking Point? Why touch the net-work of sewers to do to a large mass what, in his opinion, might be done very much better in detail? It seemed to him that it was quite within the power of their engineer to devise a deodorizing establishment at each one of the forty main outlets. He was persuaded that what had been done in Leicester could be done in London. As far as purifying the river, the experiment had been perfectly satisfactory; but as far as regarded the remunerative result, it was altogether disappointing. If the latter were not a secondary consideration, it might be against attemping the experiment in London, but the question of health was the chief thing. (Hear, hear.) He apprehended that their solid sewerage would be of less value than that of Leicester, for it was found from experiment that all the London sewerage had a great quantity of iron in it, which in Leicester was not the case; and it was well known that iron was most destructive to vegetable life. A quantity of matter had been taken up from the bottom of the river, and when a magnet was applied it had threads of iron attached to it all along. That iron came, it was supposed, from the iron shoes of the horses who were brought alongside, and from the tiers of the waggons. If they were to carry the sewerage to any distance the expense would be enormous. If a system of main interception were carried out, they would intercept all the water that is brought into London—some 80,000,000 gallons, or, according to Mr. Tite, 87,00,0000, and the sewerage matter besides, making 90,000,000. He had calculated that a stream of water containing 80,000,000 gallons would be some six yards wide, a yard deep, and two miles and a half long; and if they took and carried this mass of water to Sea Reach the loss would be felt, and a difficulty in the navigation of the river would be the result. (Hear, hear.) No drop of rain which might fall in the valley of the Thames could get into the river except at those two points. There were, then, three or four objections to the main intercepting scheme—one, its enormous expense; another, that it would take from the river what the river could ill afford to lose; and another, that it would be a very long while before they could bring it into operation. If it were possible to establish at each of the 40 outlets a building which would deodorize the contents of the sewers—it had been done at Leicester—without permitting any noxious effluvia to escape, then, by means of barges, the solid matter could be taken away; and no doubt there were districts where it would be of value. For all these reasons he was averse to the scheme on which they had bestowed so much time and attention. They were much better able to deal with the matter now than seven years ago, because of the additional aids of science; and the stimulus which had been now given in London would enable them to obtain a degree of perfection which was not to be attained in Leicester. If they were prepared to carry out a similar plan they had only to obtain an Act of Parliament to enable them to carry it out in their own way, and the thing might be done in twelve months from that day. (Hear, hear.)

Mr. DOULTON was glad that his views harmonized with those of the worthy alderman who had just sat down. The question before them was whether the plan proposed by the honourable member for Westminster would accomplish the object they had in view, with due regard to the interests of their constituents, and he trusted he would show that it would not. They had come there to-day as if the only thing they had to do was to accept a plan, and the Thames would become to-morrow a pure and perfect stream. He approved of none of the alternatives with regard to the sewerage of the western area. Messrs. Bidder, Hawksley, and Bazalgette recommended not to deodorize it, but to cast it into the Thames as at present. And, again, there was a second proposition, to combine a Thames embankment with a low-level sewer; but let them put this question to any engineer—"What would be the consequence of your embanking one side of the Thames and not embanking the other?" He had put that question to an eminent engineer, and the answer was that the embankment of the Thames on one side would be the certain destruction of the other. They were asked to adopt this sewerage plan with a Thames embankment; but where was the plan for this embankment? and how much was it to cost? They were to go to the Chief Commissioner and say they were ready to adopt that plan, and, further, to pay part of the embankment expenses, but such a course might commit the board to a ruinous expenditure. And then they were asked to-day to allow Government to say what was their proper share of the Thames embankment cost, and this at a time when they had brought Parliament to their senses, and when the press was admitting that the work to be done was a great national one, and ought to be done at the national expense. Why, Parliament was glad to come now and say to that board, "Are you prepared to give us help by converting part of the taxes of the metropolis to the great end we all have in view?" If the Thames had not stunk as it had during the past weeks, they never should have got Parliament to that. They had now a Government that would do anything, and accept the popularity arising from it. (Laughter.) He objected to the plan because it overthrew the question just as it was brought to the point to which they had at last brought it. The *Times* had said that the thing could be done properly only by the help of the nation, thus clearly showing that the public out of doors were beginning to realize the fact that this was a national question. They did not want to go to Parliament and say, "Let us do what we like with the money of the metropolis?" Were they prepared to come to a vote to-day which might hang round the neck of the metropolis an expense of £10,000,000 or £12,000,000? (Murmurs of dissent.) It was all very well to talk of £2,000,000 or £3,000,000, but they knew what engineering estimates were. Were they to be frightened to-day into the adoption of a plan which two or three weeks ago they were prepared to negative? Then there was a third question—the delivery of the sewerage at the points indicated. The deodorizing process was always ridiculed by honourable members, but if they carried the sewerage to Plumpstead it was the worst possible plan for irrigation. The amendment which he had to propose was one for the purpose of delay. (Loud ironical cries of "Hear, hear.") He adopted that cheer as an indication that he had done the State some service by delay. (Ironical cheers and laughter.) If they adopted the plan to-morrow, they had the satisfaction of knowing that it would be five years before the scheme was completed. The amendment which he had to propose was as follows:—

That, from the evidence at present in possession of the board, it is questionable whether a plan based upon the recommendation of Messrs. Bidder, Hawksley, and Bazalgette would completely and satisfactorily effect the purification of the Thames and the drainage of the low-level districts. That, before agreeing to so serious and novel an experiment as the concentration of the whole of the sewerage and its discharge at two points within the tidal range of the metropolis, it is the duty of this board to ascertain its probable effect upon the public health, and to prevent the discharge of undeodorized sewerage within that limit. That it is, further, the duty of this board to protect the interests of their constituents by preventing the infliction of an enormous and uncertain amount of taxation upon the unaided resources of the present metropolitan ratepayers. That this board, being informed that the present offensive condition of the Thames is likely to be injurious to the public health, is anxiously desirous of applying some immediate remedy. That no benefit can be derived by the metropolis from any plan based upon the report of Messrs. Bidder, Hawksley, and Bazalgette for a period of a least five years, while their recommendation that the upper and middle-level sewers should be first executed would tend to defer the purification of the river to a yet longer period. That the deodorization of the sewerage of towns has been demonstrated to be both safe and practicable, leaving nothing to be desired in a sanitary point of view, while the principle is one admitting of simultaneous application at several points within a reasonable period, and would immediately remove the threatened injury to the public health. That steps be immediately taken for the erection of the necessary apparatus upon one or more of the principal sewers discharging in the vicinity of the new Houses of Parliament.

There was evidence to show that a considerable portion of the western area did not enter at all into the plan, such as the area round the Isle of Dogs. They saw what the state of the Thames was now that the sewerage was discharged by some 60 or 70 outfalls, but would any one tell him that the sewerage discharged in a mass at two points would not be more injurious than in its present diluted state when spread over a space of some 16 miles? Then, the points of discharge were near the Government establishments at Woolwich, but surely such a thing would not be tolerated by the House of Commons. They had the testimony of almost every one to the fact that deodorization could be accomplished at the mouths of the sewers without nuisance to persons living around—even Mr. Bazalgette himself had expressed such an opinion—and the great merit of that was, that the thing could be carried into

effect in a very short time, or, at all events, put to the test, and set at rest at once and for ever; whereas the resolutions proposed by Mr. Wright would lead them on for years without any good being produced. If the thing had been done at Leicester, and nobody denied that it had, then he maintained that it could be done in London. Let members shrug their shoulders, but had they tried the experiment? He was quite sure that Parliament would never give them further powers to raise money for such a work as that which the report recommended. The only work at all approaching the main sewers proposed to be built was the Victoria-Street sewer, which had been carried out at such enormous expense—and was the result so satisfactory after all? If they adopted that plan he felt assured that the metropolis would curse the day when the Metropolitan Board came into existence. It was from that conviction that he moved the amendment which he had just read.

Mr. WAKE seconded the amendment. He did so because he doubted whether the property of the metropolis, and that only one description of property too, could bear such an incubus of taxation as would be thrown upon it in carrying out a work which was national rather than metropolitan.

Mr. BENNETT said they had engineering difficulties to contend with, which, in his opinion, should be met by engineering works. Without intercepting sewers the low-lying districts on the north side were likely to be flooded; and, as regarded the south side, the deodorization scheme must be a complete failure. He knew the Surrey side well; that side was not drained at all—the difficulty being that it was situated so low that it could not be drained in the present state of things, and therefore they must look to engineering science for a remedy. He had considered the reports of the engineers attentively, and had come to the conclusion that no scheme could be permanent or satisfactory which did not embrace intercepting sewers. (Hear, hear.) Such was his conviction, independently even of the great array of talent which he saw all coming to the same conclusion. The most eminent engineers of the day were all ranged on the side of intercepting sewers. (Hear, hear.) The Thames above London Bridge was in a frightful state, but to him the remedy seemed obvious, and that was, not to allow the sewerage to enter the river until it reached a point from whence it could not be returned. (Hear, hear.) As regarded the Westminster sewerage he would deodorize it; for the rest he would take it down according to Mr. Bazalgette's plan, and then deodorize it before sending it into the Thames. After the filth was prevented from running into the Thames above the bridges, then they had only to deal with what was bad in the water itself, or in the mud on the banks, but until new accumulations of matter were prevented from continually flowing in, he was satisfied there was no remedy. He did not apprehend any impediment to navigation from the scheme, because the tidal flow of water on the London side of Battersea Bridge was so powerful that any quantity of water that might be intercepted would not interfere with the navigation. He did not at all agree with the honourable member for Lambeth that the cost would amount to £10,000,000; he had been informed that it would be £2,300,000, and that if thrown over forty years would amount to a sum which he was satisfied the ratepayers of London would not hesitate to pay. (Hear, hear.) He was perfectly certain that the state of things which existed during the hot days could not have lasted for any length of time and the public health be preserved. (Hear, hear.) He felt some difficulty about the second part of the resolution with reference to the embankment, and should have preferred something to the effect that that board was of opinion that the main drainage of London could not be adequately and permanently accomplished without intercepting sewers. However, he should support the resolution.

Mr. OFFOR, Mr. DIXON, and Colonel KENNEDY spoke in support of the resolution.

Mr. HUDSON supported the amendment.

Mr. D'IFFANGER also supported the amendment, though he was convinced that no plan which did not embrace intercepting sewers would succeed, and such a plan must be ultimately adopted. He thought, however, the ratepayers too poor to afford the expense.

The board then divided, when there appeared—

For the amendment	11
Against it	24
Majority against	—13

Mr. ECKETT then moved an amendment, to the effect that the board, before coming to a final resolution, should await the report of the Commons' committee now sitting on the subject.

This amendment was negatived.

Mr. Alderman CUBITT then moved the following amendment:—

That it be referred to the engineer to report upon the feasibility and expediency of establishing forty deodorizing works at forty of the principal sewer outlets.

This amendment was also negatived.

The original resolutions were then put and carried, the numbers being—

For the resolutions	23
Against	8
Majority	—15

Mr. WILKINSON then moved—

That the present offensive condition of the Thames is such as urgently to require measures for its effectual remedy. That the eminent chemists who have inquired into the subject—viz., Dr. Hoffman, Mr. Witt, Dr. Letheby, Dr. Barnes, and Dr. Odling, all concur in the opinion that this offensive condition is mainly attributable to the accumulation of mud, deeply charged with putrefying sewerage-deposit, on the banks and foreshores. That it is generally admitted by the several eminent engineers who have reported on the subject, that the most effectual mode of remedying the evil arising from this accumulation of mud is by the construction of a Thames embankment, and it is also admitted that such embankment is almost absolutely indispensable to any complete plan of main drainage, and would, under any circumstances, materially facilitate its execution. That it is desirable, pending the adjournment of the main-drainage question by the board, and the inquiry now going on before a parliamentary committee on the state of the Thames, that this board should collect as much information as possible upon the expediency of connecting an embankment of the Thames with any plan for the main drainage of the metropolis. That the engineer and architect be instructed to complete, with all practicable despatch, plans and estimates for an embankment of the Thames on the north side, from Westminster Bridge to London Bridge, and on the south side, from Battersea New Bridge to London Bridge, including therein a plan for the construction of a low-level sewer on the north side of the Thames.

The board being evidently averse to enter upon the discussion, the motion was withdrawn, and the meeting soon after separated.

INTERVIEW WITH THE FIRST COMMISSIONER OF WORKS ON THE MAIN DRAINAGE QUESTION.

At the Ordinary Weekly Meeting of the Board, held on Friday, the 2nd inst., in the Council Chamber, Guildhall, Mr. J. THWAITES in the chair, Mr. WOOLRYCH, the clerk, read the report of the deputation appointed by the Board on Tuesday last to wait upon Lord John Manners, and present a plan for the main intercepting drainage of the metropolis. The deputation gave the following account of the interview which they had on Thursday last with the First Commissioner of Public Works:—

The Chairman, accompanied by Lieut.-Colonel Kennedy, Mr. Carpmael, Mr. Bristow, Mr. Drew, Mr. Bidgood, and Mr. Savage, at the time named, proceeded to the Office of Works. The engineer and clerk of the board were also in attendance. The plans, sections, and estimates having been presented to the First Commissioner, the chairman proceeded to explain the general scope and leading features of the scheme as finally approved by the board, and especially called his attention to those portions of their resolution relative to the proposed deodorization of the western sewerage at its junction with the Thames, as well as to the views of the board in relation to the construction of the low-level sewer on the north side of the Thames in connexion with an embankment, and also as to the proportion in which the board were prepared to contribute to the cost of such embankment; and he referred to the contingencies affecting the eventual provision to be made on the completion of the works for the delivery or disposal of the sewerage at the outlets. The chairman also explained generally the reasons of the board for selecting the particular outfalls adopted, and referred to the engineering and other objections to carrying the works further down the river; but he at the same time pointed out that if it should be deemed necessary the works could be extended to any point that might be selected, provided the requisite funds should be forthcoming from other sources than by direct rates on the metropolis. He also said, though the board considered the scheme submitted sufficient in an engineering and sanitary point of view, and conformable to law, it might possibly become necessary to modify the terms of the Act, and to define the points of outfall by express enactment, in which case the board would expect that the necessary amendments in the Act should be effected by the aid of the Government. The chairman also particularly directed the attention of his lordship to the letter which he had addressed to the late Chancellor of the Exchequer (Sir G. C. Lewis), on the 17th of January, 1857, requesting the aid of Her Majesty's Government in obtaining the funds necessary for carrying out the main drainage works and other metropolitan improvements, and adverted to the fact that no answer had been received to that communication. The chairman entered into general explanations in corroboration of the views expressed in that letter, and urged the strong claims of the board to the assistance of the Government in raising funds, and the absolute necessity which existed for placing at the disposal of the board other sources of income than those derived from a direct tax on houses.

His Lordship made various inquiries with a view of acquainting himself with the

Price Current.

CASTINGS, per Ton.

Average Weight of Cast-Iron Gas-Pipes, per Yard.

1¼ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow	Newcastle.	Wales.	Yorkshire, Derbyshire and Staffordshire.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Pig Iron, No. 1	4 10 0	2 14 0	3 0 0	4 0 0	4 5 0
1¼ and 2 inches Socket Pipes	7 15 0	7 0 0	7 5 0	7 10 0	7 5 0
2½ and 3 " " "	7 5 0	6 15 0	7 0 0	7 5 0	7 0 0
4 and 5 " " "	7 5 0	6 10 0	6 15 0	7 0 0	6 15 0
6 in. & upwards " "	7 0 0	6 5 0	6 5 0	6 15 0	6 5 0
Retorts, 1st fusion, hot blast	6 15 0	...	6 15 0	7 0 0	6 15 0
" 2nd " cold "	7 15 0	...	7 0 0	7 5 0	7 0 0
Tank Plates, ⅜ thick and above	7 5 0	6 10 0	6 15 0	7 0 0	6 15 0

COALS.

NEWCASTLE. Unscreened.	s.	d.		SCOTCH CANNEL.	per ton.
Whitwell Primrose	6	3	per ton	Boghead, at Leith	32s. 0d.
Medomsley, Eighton Moor, and Burnhope	6	6	"	Kirkness, best	23 0
Pelaw	6	9	"	Capeldrae, 1st quality	20 0
New Pelton, Peareth, South Pelaw, Washington Hutton, and South Peareth	7	0	"	" 2nd "	12 6
Pelton	7	9	"	Lesmahago, at Glasgow	25 0
Ramsay's Newcastle Cannel	16	0	"	" " Leith	27 6
				Arniston	22 0
				Wemyss	20 0
				Knightswood	18 0
				Pirnie	15 0

SUNDRIES.

Best Newcastle fire-bricks	60s. per 1000	English pig lead	£22 per ton
" " clay	12s. per ton.	Welch bar iron, in London	£7. 5s. "
Cliff's fire-bricks at Wortley, 57s. 6d. p. 1000		Foreign spelter	£25 "
Ingham's fire-bricks at Wortley, 55s. p. 1000		English block tin	£118 "
Tough cake copper	£107. 10s. per ton.	Banca "	£115 "
Tarred rope yarn	26s. per cwt.		

WROUGHT-IRON TUBING, subject to 40 per cent. Discount.

	⅜ inches.	½ inch.	¾ inch.	1 inch.	1¼ inch.	1½ inch.	2 inches.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent welded tubes, from 2 to 12 feet, per foot	0 4½	0 5	0 7	0 10	1 0	1 8	
" " " 6 in. to 18 in., each	0 9	1 0	1 3	1 9	2 0	3 0	
Connecting pieces, or long screws	0 11	1 2	1 6	2 0	2 3	3 6	
Bends, springs, and elbows—wrought iron	0 8	0 10	1 0	1 9	2 3	3 9	
Tees, wrought or cast	1 2	1 1	1 6	2 0	2 6	4 0	
Crosses, wrought or cast	1 2	1 6	2 0	2 6	3 0	4 6	
Iron cocks	2 6	3 3	4 6	7 6	9 6	17 6	
" with brass plug	4 6	5 6	7 0	9 6	16 0	28 0	
Diminishing sockets, caps, plugs, and nipples	0 4	0 5	0 6	0 8	0 9	1 3	
Plain Sockets	0 3	0 4	0 5	0 7	0 8	1 0	
Syphons, 2 quart	12 0	13 0	13 6	14 0	15 0		

FREIGHTS.

Coastwise—Newcastle.	Per Ton.	*Foreign.*	Per Keel.
Chatham & Roches- [ter	5s. 3d	Boulogne & Calais	£ 7 0s
Cork	8 0	Barcelona	22 0
Dover	5 6	Bordeaux	13 0
Dublin	8 0	Cadiz	15 0
Exeter Quay	7 6	Copenhagen	8 10
Folkestone	5 6	Dieppe	£7. 10s. to 8 0
Hastings	7 0	Genoa	20 10
London	5s. 3d. to 5 6	Hamburg	£7. 5s. to 7 10
Lowestoft & Yar- [mouth	4 0	Havre	8 5
Lynn	4 6	Leghorn	20 0
Portsmouth	6 6	Lisbon	15 0
Plymouth	7 0	Rotterdam	7 0
Whitstable	5 6	Stettin	£10. 10s. to 10 15
Weymouth	7 0	Trieste & Venice	£21 to £23

main features of the scheme submitted, and inquired particularly whether the board would be willing so far to yield to the demands of the inhabitants of Erith and other places on the banks of the Thames, in case the discharge of the sewerage at the outlet proposed should be found to be attended with nuisance, and engage to resort to proper means of deodorization and disinfection?

The Chairman replied that he apprehended it was the duty of the board, in this as in all their other operations, to conduct them so as to make proper provisions to prevent nuisance, but that the deputation were not now in a position to pledge themselves to the specific processes of deodorization and its attendant obligations.

The First Commissioner also pointed to the circumstance that the plan submitted showed a low-level sewer along the foreshore of the Thames, and asked if the board had prepared a plan of the Thames embankment; and, if so, whether the cost was included in the estimate laid before him?

The Chairman explained that the plan of this board only regarded the Thames embankment in connexion with the low-level sewer, and that they were prepared to contribute to the cost of that work a sum more than equivalent to the cost of carrying the sewer in any other line, and that he considered to be the limit of their obligation; but that, though the board deemed the Thames embankment to be of paramount importance as tending to promote the purification and improvement of the Thames and other objects, yet a construction of the embankment itself appeared to be the obligation of the Government and not of the board; he conceived it to be beyond their present powers.

His Lordship having listened to the explanations furnished to him by the chairman and the members of the deputation, requested that the principal points touched upon might be reduced into writing, to which the deputation assented.

Finally, the First Commissioner said that the plan of the board should receive his best consideration; but, as the points involved were not confined to merely engineering questions, but embraced legal and financial considerations, it would be necessary that he should confer with the other members of the Government in relation to the matters adverted to without delay, and that his decision should be communicated to the board with all practicable despatch.

(Signed) J. Thwaites. A. B. Bristow.
W. Carpmael. Henry Bidgood.
J. Kennedy. B. Drew.
J. Savage.

Mr. Bristow gave notice that at the next meeting of the board he would move, "That should the delivery of the sewerage into the river Thames, under the conditions already determined upon by the board, be found hereafter to cause a nuisance in the neighbourhood of the proposed outfall, and not to realize the expectations respecting it, the board hereby undertake to adopt such further measures as may appear to the board to be necessary for the complete abatement of such nuisance."

The report of the deputation was ordered to be printed, and also entered on the minutes.

The other business, which was entirely of a formal character, was then disposed of, and the board adjourned.

Serious Gas Explosion in Bradford.—An explosion of gas occurred last week, under somewhat remarkable circumstances, in a house occupied by Mr. Lupton, 8, Belle Vue, Manningham Lane, Bradford. It appears that the family have gone to reside at Cottingley, and that Mr. Lupton will cease to be tenant of the house in question in November next, but one of the bed-rooms in the second story was kept furnished in order that he might sleep there occasionally. In this room, in Mr. Lupton's absence, it has been the practice to have the gas burning continually, though no person lived in the house, the object being to keep the bed-room properly aired and the bedding free from damp. About five o'clock on Friday afternoon there was a tremendous explosion in the house. The windows and window-shutters, and the doors also, on the ground floor, were smashed and blown open, and the other wood-work was much scorched and charred. In the bed-room already spoken of the doors and windows were damaged, and other injury was done up stairs. The great force of the explosion, however, had evidently been in the front room on the ground floor, and in the lobby and the kitchen. It is supposed that, owing to the deficiency of water in the apparatus, the gas had escaped from a chandelier in the lower front room, that it had passed through the keyhole and crevices in the door into the passage, and thence into the other rooms, and that as soon as the volume reached the light in the bed-room the explosion took place. Little or no damage was done to the furniture in the bed-room. The damage to the house is estimated at £50, which is covered by insurance in the Imperial Fire-Office, whose policies, it appears, embrace gas explosions as well as ordinary fire risks.

Advertisements.

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WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

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W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of
RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY,
beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.
The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.
GAS OVENS IN SEGMENTS OF EQUAL QUALITY.
London Agents, CHADWICK and AKEROYD, Willington Stone Wharf, Regent's Park Basin.
N.B.—*Export orders continue to have prompt attention.*

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ESTABLISHED IN 1795.

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THESE RETORTS are unrivalled in excellence, being the BEST FINISHED INTERNALLY, and THE MOST CORRECT IN FORM, of any in the Kingdom. From the peculiar composition used in working up the face of the material, they are rendered unusually smooth, close, and FREE FROM SURFACE CRACKS, thus, in a great measure, preventing leakage and the adhesion of carbon to their interior service.
To meet the yearly increasing demand of UPWARDS OF THIRTY SEASONS and to carry out the late improvements in the manufacture, the Premises have been re-erected and much enlarged, and Engineers may rely WITH CONFIDENCE on their orders being completed with a greater regard to despatch than by any other House.

THE WORKS ARE WELL SITUATED
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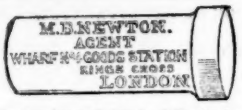
J. CLIFF'S
FIRE BRICKS, GAS RETORTS, &c.



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one of which answers the purpose of THREE ordinary Valves, as applied to Purifiers, or in shutting off and passing Station-Meters, Governors, or other apparatus, while the Connecting-Pipes are also much simplified.

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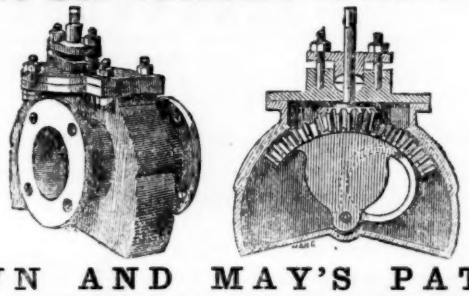

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These Meters are as simple and durable as the Gas-Meter, and as correct as that instrument in the registration of the fluids passing through them.

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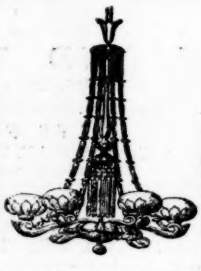

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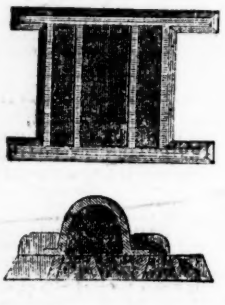

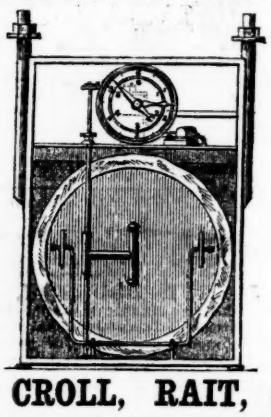

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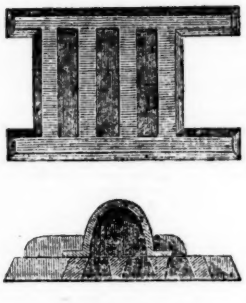

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London: Printed by WILLIAM BOUGHTON KNIGHT, (at the office of Joseph Clayton, 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, July 6, 1858.